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BY

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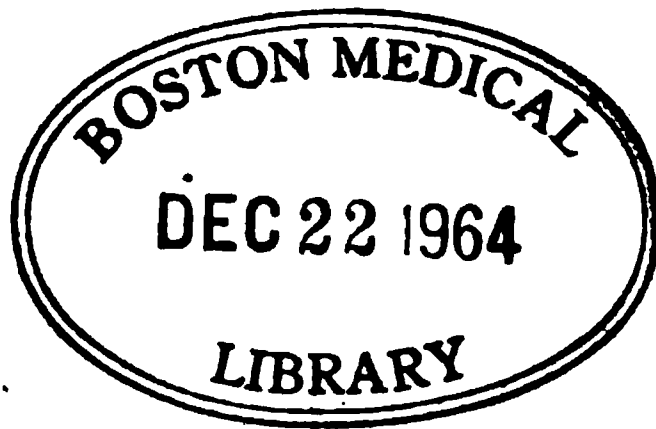
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CONTENTS OF VOLUME XXII.

NUMBER I.

	PAGE
1. Observations on the Functional Examination of the Normal Ear. By Prof. F. Siebenmann. Translated by Dr. E. B. Dench, New York	I
2. Results of the Functional Examination in Cases of Pure Catarrh of the Eustachian Tubes. By Prof. F. Siebenmann, Basel. Translated by Dr. E. B. Dench, New York City	12
3. A Case of Unilateral Total Absence of the Labyrinth Caused by Scarlatinous Otitis Intima. By Holger Mygind, M.D., Copenhagen	17
4. An Apparatus of Precision for Inflating and Medicating the Tympanum. By Thomas Hubbard M.D., Toledo, Ohio. (With an illustration)	27
5. On Five Cases of Otitic Brain Abscess with a Short Description of Otitic Brain Abscesses in General. By H. Heiman, Warsaw. Translated by Dr. Ward A. Holden	33
6. Histology of Two Petrous Bones of a Girl Completely Deaf from Scarlet Fever; Died of Purulent Meningitis. By S. Moos, Heidelberg. Translated by Dr. C. Zimmermann, Milwaukee, Wis. (With Plates I. and II. of vol. xxiii., German Edition)	64
7. Removal of the Stapes. By Clarence J. Blake, M.D., Boston	78
8. Report on the Progress of Otology during the First Half of the Year 1892. By Prof. Ad. Barth, Marburg, and Dr. A. Hartmann, Berlin. Translated by Dr. Max Toeplitz, New York	89
FIRST PART: Anatomy and Physiology. By Ad. Barth.	
SECOND PART: Pathology and Therapeutics. By A. Hartmann.	
9. Reviews. Translated by Dr. Max Toeplitz, New York	131
Report on the Progress of Otology during the Years 1890 and 1891. By Dr. L. Blau.	
Deaf-Mutism in the Grand-Duchy of Mecklenburg-Schwerin: A Statistico-Otological Study. By Dr. Lemcke.	
The Study of the Functions of the Different Parts of the Labyrinth of the Ear. By Stanislaus von Stein.	

	PAGE
Normal and Pathological Anatomy of the Nose and its Pneumatic Appendices. By Prof. D. E. Zuckerkandl.	
Baratoux. Guide Pratique pour l'Examen des Maladies du Larynx, du Nez et des Oreilles. (Practical Guide to the Examination of the Diseases of the Larynx, Nose, and Ears.)	
Anatomical Examination of the Paths of the Blood-Current in the Labyrinth of the Human Ear. By O. Eichler.	
Handbuch der Ohrenheilkunde. Edited by H. Schwartze.	
The Mastoid Operation. By Samuel Ellsworth Allen.	
10. Miscellaneous Notes	137
<i>A.</i> —British.	
<i>B.</i> —American.	
11. Obituary.	141

NUMBER 2.

1. Otitic Brain-Disease; its Varieties, Diagnosis, Prognosis, and Treatment, Illustrated by Cases from the Writer's Practice. By Herman Knapp, M.D.	143
2. An Attempt to Replace an Auricle Bitten off in Childhood. By B. Alex. Randall, Philadelphia. (With four drawings) . . .	163
3. A Case of Epithelioma of the Auricle. By E. B. Dench, M.D. . . .	166
4. The Hearing Power in Deaf-Mutes; Being the Results of the Examination of 175 Deaf-Mute Children. By James Kerr Love, M.D.	170
5. The Best Bend of Shaft and Handle in Instruments for Operation in the Depth of the Ear Canal. By Robert Barclay, A.M., M.D., St. Louis, Mo. (With a wood-engraving)	179
6. A Case of Thrombosis of the Lateral Sinus. By John L. Adams, M.D.	182
7. The Propagation of Affections of the Tympanum through the Carotid Canal into the Cerebral Cavity. By Dr. Otto Koerner, Frankfort-on-the-Main. Translated by Dr. Max Toeplitz, New York	191
8. Removal of the Stapes. By Clarence J. Blake, M.D., Boston . . .	196
9. A Case of Otitis Media Acuta Purulenta with Caries of the Mastoid Process Due to Caries of the Second Molar Tooth. By Dr. E. Schwartz, of Gleiwitz, Silesia Translated by Dr. Max Toeplitz, New York	203
10. The Anatomical Condition Found in a Case of Deaf-Mutism following Scarlatina. By Dr. V. Uchermann, Christiania. Translated by Dr. S. E. Allen, Cincinnati, O.	208
11. On the Clinical Signs of the Affections of the Auditory Nerve. By Prof. G. Gradenigo, Turin, Italy. Translated by Dr. S. E. Allen, Cincinnati, O.	213

Contents.

v

	PAGE
12. Some Further Investigations upon the Continuous Tone-Series, especially with Reference to the Physiological Upper and Lower Tone-Limit. By Prof. F. Bezold, Munich. Translated by Dr. E. B. Dench, New York. (With two illustrations)	216
13. Miscellaneous Notes British Meetings of Societies. Appointments.	226
14. Pan-American Medical Congress	229
15. Books Reviews Lehrbuch der Ohrenheilkunde. By A. Politzer. New York Eye and Ear Infirmary Reports.	230
16. Editorial Notice	231

NUMBER 3.

1. Three Cases of Unintentional Opening of the Lateral Sinus. By J. E. Sheppard, M.D., Brooklyn, N. Y.	233
2. Short Description of the Temporal Bones of Deaf-Mutes Belonging to the Pathological Museum of the Copenhagen University. By Holger Mygind, Copenhagen	239
3. Hypertrophic Condition of the Tympanic Mucous Membrane in an Infant. By Arthur H. Cheate, F.R.C.S., London. (With one drawing)	268
4. The Pathology of Deaf-Mutism. By James Kerr Love, M.D., Glasgow	270
5. Osteoma of the Mastoid. By J. Orne Green, M.D., Harvard University	280
6. A Series of Cases of New Growths of the Ear. By J. Orne Green, M.D., Harvard University	284
7. Two Cystoid Polypi of the Middle Turbinate Bone. By W. Freudenthal, M.D., New York. (With four drawings in the text)	296
8. Removal of the Stapes. By Clarence J. Blake, M.D.	305
9. Mucocele and Empyema of the Ethmoidal Cells and Sphenoidal Sinuses, Causing Displacement of the Eyeball; their Operation from the Orbit. By Herman Knapp, M.D.	313
10. Miscellaneous Notes	329
<div style="margin-left: 20px;"> I.—British. A.—Meetings of Societies. B.—Appointments. C.—New Society. II.—American. A.—Meetings of Societies. B.—Appointments. C.—Editorial Notice. </div>	

NUMBER 4.

	PAGE
1. The Stacke Operation for Caries Involving the Middle Ear as Modified and Practised by Prof. Hermann Schwartz. With an Historical Sketch, Method of Operating, and Report of Twelve Consecutive Cases. By Dr. C. R. Holmes. (With ten figures in the text)	337
2. A Contribution to the Anthropology of the Ear in Criminals. By Dr. Hans Daae, Christiania. Translated by Dr. Ward A. Holden	378
3. Contribution to the Microscopic Anatomy of the Human Nasal Cavities, Particularly of the Olfactory Mucous Membrane. By Dr. Hermann Suchannek, Zurich. Translated by Dr. J. A. Spalding, Portland, Me. (With eighteen schematic drawings)	384
4. A Peculiar Case of So-called Bezold's Mastoiditis. By Dr. W. Vulpius, of New York	390
5. An Unusual Case of Bilateral Fracture of the Temporal Bone. By Dr. W. Vulpius, New York	396
6. A Case of Removal of the Stapes. By Prof. Friedr. Bezold, Munich. Translated by Dr. Ward A. Holden, New York	400
7. Removal of the Stapes. By Clarence J. Blake, M.D.	404
8. Report on the Progress of Otology during the Second Half of the Year 1892. By Prof. Ad. Barth, Marburg, and Dr. Arthur Hartmann, Berlin. Translated by Dr. Max Toeplitz, New York.	415
A.—Anatomy. { By Ad. Barth. B.—Physiology. { C.—Pathology and Therapeutics. By A. Hartmann.	
9. Report on the First Meeting of the Section on Otology of the Pan-American Medical Congress, held September 5th, 6th, and 7th, at "The Arlington," Washington, D.C. By Dr. Max Thorner, Cincinnati	479
10. Book Reviews	483
I.—Text-book on Otology for the Student and Practitioner. By Dr. Kurd Bürkner. Reviewed by E. Bloch, Breslau, and translated by Dr. Max Toeplitz, New York.	
II.—A Manual of Diseases of the Ear. By G. P. Field, M.R.C.S.	
11. Index	487

ARCHIVES OF OTOTOLOGY.

OBSERVATIONS ON THE FUNCTIONAL EXAMINATION OF THE NORMAL EAR.

BY DR. F. SIEBENMANN,
PROFESSOR UNIVERSITY OF BASEL.

Translated by Dr. E. B. DENCH, of New York.

THE following paper was suggested by the investigations of Schwabach on the absolute exaggeration of bone-conduction in certain forms of middle-ear affections and of its diminution in labyrinthine disease, by the determination of the upper true limit by Burckhardt-Merian, and also by the statistical results of Bezold as to the diagnostic value of Rinne's experiment. This last observer considered more especially the physiological side of the question, and by his experiments upon the normal ear established firmly the progressive changes in bone-conduction and the loss of perception of low tones which occur in certain pathological conditions.

As these experiments are evidently of fundamental importance, I decided to verify most of them experimentally by the examination of the middle ear in a large number of cases.

In these experiments I used, beside the fork a', the low-toned forks A and C-I devised and recommended by Bezold. I also extended my field of experimentation so that in all cases I determined the upper tone-limit, and when possible the variations in the results of the tests by changes in the intratympanic pressure. I have tabulated¹ the

¹ The table, six pages, is omitted in the translation, the results being fully described in the text.—Ed.

results of these time-consuming experiments, and a study of the table reveals the following :

Forty-five young adults of fairly good intelligence were selected, all of whom presented normal membranæ tympani. Of these, twenty-three had normal hearing, and were subjected to the tests of Rinne, the Weber-Schwabach experiment, and the test for the upper tone-limit, with fairly conclusive results. In fifteen cases the influence of artificially increased or diminished intratympanic pressure on bone- and air-conduction was carefully studied.

Technique of the Examination.

1st. The drum membrane in each case was carefully examined by daylight, and its behavior under auto-inflation and aspiration noted. Cases in which the upper posterior segment of the membrane did not show a distinct bulging on Valsalvan inflation and outward movement of the short process with prominence of the posterior fold were not subjected to the tests.

The hearing was tested in a room sixteen metres long, the ear not tested being closed by the little finger inserted into the external meatus; care was also taken that the patient should not look at the investigator during the tests. Only those persons who were able to repeat perfectly, at this distance, numbers of two figures, whispered as Bezold advises with residual air, and who could also hear the Politzer acoumeter distinctly at this distance, were considered to have normal hearing, and were subjected to the succeeding procedures.

The Weber-Schwabach test was performed with the A fork in the following manner : The fork was struck a medium blow on a soft elastic surface—as, for example, upon the muscles of the thigh, directly above the internal condyle, the knee being flexed at a right angle; the handle of the fork was then applied to the head of the subject, the point selected being situated about on a line with the anterior border of the external auditory meatus. The fork was not pressed upon the skull, but simply rested by its own weight.

The usual precautions observed in conducting tests with tuning-forks were taken.

Schwabach's test depends upon the difference in the duration of bone-conduction in the patient as compared with that of the investigator. In order to measure the difference in time, we availed ourselves of a chronoscope, the second-hand of which could be set in motion at any moment, could be arrested at any part of its course, and returned to 0° or 60° by simply pressing a slide. The difference in time determined by the experiment could then be read off by the investigator at the end of the test. By proper manipulation of the slide of the chronoscope with the fingers of the left hand the experimenter can give his exclusive attention to the right hand, which manipulates the tuning-fork; it thus becomes possible to avoid many errors of experiment which must occur when the ordinary watch is used to determine the difference in time, in which case the eye must not only observe the right hand, which holds the fork, but also the watch held in the left hand. In a similar manner the time difference in Rinne's test was more easily determined. In Rinne A the duration of bone-conduction was measured while the fork was placed on the vertex. In experiments with Rinne a' the fork was moderately pressed against the skull behind the ear at the base of the mastoid process.

For the determination of tone-limits and of the time during which the fork C-1 was heard we instituted control experiments in which the subject was not able to see the investigator. All untrustworthy results have been excluded from the tabulated cases.

In testing with Koenig's rods only one ear was tested.

For the determination of the lower tone-limit the lower bass C (C-1) fork was used, as advised by Bezold. It was stuck upon the flexed knee in the manner already described, as in this way the over-tones seemed to be best avoided. The length of time that this fork was heard was determined in fifteen patients, due allowance being given to the above precautions.

As to the determination of the increase or diminution in bone-conduction under auto-inflation or aspiration, it is un-

necessary, after the teachings of Bezold and the above explanation, to enter more into detail as to how I arrived at my results. Bezold found that this portion of the work was so troublesome and tedious that he was not able to make any exhaustive investigations in that direction. We did not think it wise to fatigue our patients by continuing the pressure of auto-inflation during the entire time of vibration of the fork. It is not important that this should be done, moreover, as the fork A vibrates through a relatively long interval, and slight differences in the strength of the blows might give rise to decidedly divergent results. We proceeded then so that in one series of experiments the value of Rinne's test was determined, while in another series the test was so modified that when the fork was no longer heard by bone-conduction it was held for half a minute in front of the ear, when the patient performed Valsalvan inflation, and continued this until the fork was no longer heard. The difference between the average results of these two series is the number of seconds that air-conduction is reduced by auto-inflation.

A change in the upper tone-limit, in consequence of an alteration in the intratympanic pressure, was noted in those cases only in which it had been determined without question by several parallel experiments.

The determination of alterations in intensity of the higher tones, brought about by auto-inflation, was tested, not by holding the Galton whistle close to the ear, but at a distance of from one to ten feet, since the results obtained in this manner are more distinctive.

Each number given in the table represents an average of the results of at least two, and usually of three or four, similar successive experiments.

Results of the Tests.

The test of the hearing distance in forty-five cases showed that twenty-three were able to understand whispered speech at a distance of fifteen metres. We did not necessarily consider these as possessing normal hearing, and the need of

being cautious on this point was demonstrated by the subsequent use of Politzer's acoumeter and further functional tests. In some cases in which whispered numbers were understood at a distance of fifteen metres perfectly well, but in which the acoumeter was not heard distinctly at this distance, we found regularly other defects, such as the localization of bone-conduction in one ear, lowering of the upper tone-limit, abnormal shortness in the time of Rinne's test, paracousis loci for deep notes, etc. Exceptionally an apparently healthy ear, which perceived whispered numbers at twenty metres and the acoumeter at fifteen metres, exhibited functional defects in the test for the upper tone-limit, and in the perception of sound by bone-conduction. The belief, which is constantly gaining ground, that Weber's test should not be considered of too great diagnostic importance, was confirmed by my experiments. Schwabach's test, which I believe to be of great diagnostic importance, was made with the A fork, as advised by Bezold, and the results were in many instances verified by the fork a', since the vibrating fork gives rise to a sensation peculiar to itself and at least ninety per cent. of my cases were unable to tell whether the vibrations of the fork were simply felt or were heard.

Schwabach's test is particularly valuable in many cases of middle-ear disease in which the duration of bone-conduction for the fork A is much larger and more distinct than when the lower forks are used; here also an error is impossible, since the normal ear hears the fork A several seconds after its vibrations are no longer felt. This condition is very noticeable in most varieties of pure middle-ear affections with increased tension of the auricular ligament, for here, as Bezold has proved, the fork A placed upon the skull is always heard after its vibrations are no longer felt. My table shows that even in the normal ear the duration of bone-conduction may vary in different cases as much as ten seconds. A shortening in the time of Rinne's test is not observed in cases where the Schwabach experiment gives a distinctly positive number. Rinne's test with the A fork was usually positive, varying from + 38 to + 64 seconds,

the average in thirty-seven cases being + 48 seconds. Bezold in his experiments found it to be + 42 seconds. An increased positive value of from 5 to 15 seconds is observed if the tuning-fork, after it is no longer perceived by bone-conduction, is not immediately held in front of the ear but only after an interval of 20 to 30 seconds, as was done in our investigations. Our positive results are, therefore, higher than those obtained by Bezold.

The test for the determination of the upper tone-limit was of special interest to us and gave fairly uniform results. Unfortunately, the Galton whistles are so constructed and graduated that they differ considerably from each other. The testing of the upper tone-limit with the rods ut 9, mi 9, and sol 9 was undertaken in thirteen cases. Seven perceived mi 9 as a distinct ringing sound. In no single case was sol 9 heard. Six heard ut 9. The upper tone-limit then, according to my tests, would lie between c' and e' of the German scale, as a rule, and usually nearer the latter than the former. Blake found the average upper tone-limit to be mi 9. Burckhardt-Merian asserts that two patients tested by him heard ut 10, while Blake found still higher tone limits. It is to be remembered, however, that under certain pathological conditions, such as defects in the tympanic membrane, absence of the incus, etc., the upper tone-limit can be raised, and that our results were obtained in individuals whose ears had been carefully proved to be perfectly normal, and not in those in whom any pathological condition of the auditory apparatus existed.

As an important result of another series of experiments it was shown that the Bezold contra C (C⁻¹) fork was heard distinctly by forty-five cases tested. When the fork was struck a moderate blow upon the knee, the sound was perceived for from 11 to 23 seconds—16 to 17 seconds being the average. The great difference in the duration of the sound in my experiments and the results obtained by Bezold depends principally upon the difference in the character and strength of the blow setting the fork in vibration.

Aside from these slight variations, my investigations upon a large number of persons with normal hearing confirm the

important fact first observed by Preyer and corroborated by Bezold in his own case, that the note C⁻¹ lies within the range of normal audition, and when this note is not perceived pathological changes must be present. We have, therefore, in this low note, whose vibrations are relatively strong and of long duration, an incomparably fine test. For two years we have used this test in all cases where the decision of diagnosis and prognosis has been based entirely upon the result of the functional examination, and we could not do without the instrument. The fact that by a change of the overtone clamps the same instrument can be made to produce the different notes of the contra-octave, gives to it naturally an especial value as a means of determining exactly the lower tone-limit on the octave.

We next consider the influence of artificial changes in intratympanic pressure upon the results obtained in the functional examination of the ear. Like Bezold, we observed radical changes in bone- and air-conduction for the fork A and a difference in bone-conduction for the fork C⁻¹. As we extended our experiments to the upper tone-limit also we observed new and interesting facts.

With reference to the first point under consideration, we also found that, whenever aspiration and auto-inflation were successfully done under the influence of these procedures bone-conduction for the A fork was altered in the manner already stated by Bezold. Bezold found that in his own case during Valsalvan inflation a prolongation of bone-conduction. We found in two cases bone-conduction diminished by auto-inflation; in one case it was unchanged, and in eleven cases the duration of bone-conduction was prolonged for periods of from 5 to 11 seconds, the average being 6½ seconds.

The following case is interesting :

CASE I.—H., æt. twenty-one, suffered from scarlet fever at the age of three, since which time he has had constant otorrhœa. I found upon examination complete absence of the membrane upon each side. The ossicles were present, however, and could be seen through the thin membrane covering them. The malleus and incus were displaced upward and inward, and were adherent in

some places to the mucous membrane of the tympanum. There was no thickening of the membrane over the round and oval windows or in other visible portions of the tympanic cavity. The hearing distance for whispered numbers was : R, $\frac{1}{\infty}$; L, 70 cm. Lower tone-limit, L, $F - 1$. The suppuration soon ceased on treatment. Some time later the patient consulted me for loud tinnitus and dizziness. I resolved to mobilize the stapes directly, but first I performed the following experiment to determine the influence of an increase in tension of the annular ligament of the stapes upon bone-conduction. The tuning-fork A having been set in vibration was held lightly on the skull by an assistant until its tone was lost. During this time I held a pressure-sound free on the meatus. As soon as the patient indicated that he no longer heard the fork, I placed the pressure-sound firmly but lightly upon the incudo-stapedial articulation which had previously been cocainized. Under the influence of an equable and constant pressure the tone previously lost was again perceived clear and strong through a period of from forty-two to fifty-two seconds (three experiments). The weight and pressure on the head of the stapes also produced a noise which the patient described as a blowing or gurgling sound, from which the note of the fork A could be easily distinguished. The patient of his own accord stated also that he heard the forks A and a' much more distinctly when pressure was made upon the stapes. Forks in which, by means of clamps, the vibration was stopped as soon as the sound was no longer heard by bone-conduction, were used without the knowledge of the patient, and the negative results obtained proved the absolute truth of his answers. Bearing in mind that a more complete closure of the meatus will augment bone-conduction, the experiment was so conducted as to exclude a possible source of error.

The results confirm the observation already made by Bezold, that increased tension of the annular ligament of the stapes prolongs the duration of bone-conduction.

The aspiration experiments gave results in only five out of fifteen cases tested. In all of these the duration of bone-conduction was diminished from 1 to 9 seconds, the average being 6 seconds. Bezold found the diminution to be somewhat greater, viz., 8 seconds. The air-conduction for the fork A was diminished by aspiration as well as by auto-

inflation, the average shortening being 16 seconds, the extremes being 9 and 24½ seconds. I cannot explain the cause of the diminution. .

The aspiration experiment was possible only in a minority of the cases, as every Eustachian tube is not sufficiently patent to admit of this procedure. Bezold observed that the low point of the range of audition in his own case was changed both by aspiration and auto-inflation, the tone of the A fork being completely obliterated by the first procedure, and the intensity diminished by the second. Our own results were similar, but not so distinctive.

A distinct and, as far as I know, as yet undiscovered alteration in the hearing power for high notes is elicited during auto-inflation, in that almost without exception the upper tone-limit rises and the highest part of the scale is more distinctly heard. In applying this test one ear is stopped with moist cotton, while the Galton whistle is held at such a distance from the vertex that a certain note sounded upon it is heard faintly or not at all. If now this note is continually sounded, it will be found that when auto-inflation is performed the note will be heard clearly and distinctly. With the cessation of the procedure the note is no longer heard.

On the other hand, it was found during aspiration that in three patients the upper tone-limit was lowered, while in three it was unaffected.

The following case shows in how marked a degree the perception of not only the lowest but also of the highest notes can be modified by changes about the oval window.

CASE 2.—A. L., æt. twenty-five, a few days before he came under observation accidentally forced a small splinter into the right ear, which up to that time had been normal ; there was slight pain but no dizziness. At present there are tinnitus and impairment of hearing. Inspection of the right drum-membrane reveals a fresh round perforation in the upper and posterior quadrant, with pulsation along the upper border. The long arm of the incus and the stapes were visible deep in the perforation, and were very much reduced. The right ear was otherwise normal. The left ear was normal.

Hearing distance $\begin{cases} \text{R, } 5 \text{ cm (whispered numbers).} \\ \text{L, } > 500 \text{ cm (whispered numbers).} \end{cases}$
 Weber-Schwabach, a', Rt. side + 5 seconds (in the diseased ear).
 Rinne $\begin{cases} \text{R} - 6 \text{ seconds.} \\ \text{L} + 15 \text{ seconds.} \end{cases}$
 Range of hearing $\begin{cases} \text{Rt. ear, Galton, 3 to a (without a break).} \\ \text{Lt. ear, " 1.9 to c}^{-1} \text{ (without a break).} \end{cases}$

If we summarize shortly the most important results of our work, the following principal facts are presented:

I. The healthy ear in youth possesses a hearing distance of from 25 to 26 metres for whispered numbers, and of at least 15 metres for the Politzer acoumeter.

II. Schwabach's test with the fork A reveals not considerable differences in the duration of tone perception even in perfectly normal ears.

III. In Weber's test the fork was heard louder in one ear in one eighth of the normal cases tested.

IV. Rinne's test with the Bezold-Katsch fork A gives in normal cases a positive result, +48 seconds being the average.

V. The upper tone-limit varies little in cases where the hearing is normal. It lies between ut 9 and mi 9, as determined with Koenig's rods ($c^7 - e^7$). With Galton's whistle the range is within .6 of the minor division of the particular note which represents the limit.

VI. The Bezold-Katsch fork C^{-1} (33 double vibrations per second) is perceived in all cases where the hearing is normal for about 16 seconds, the fork being struck a medium blow.

VII. Aspiration of the tympanic cavity shortens the duration of perception of the fork A both by air- and bone-conduction.

VIII. Valsalvan inflation diminishes air-conduction for the fork A, and usually increases bone-conduction (but in one seventh of the cases diminishes it). (Sections VII. and VIII. confirm the results of Bezold's experiments.)

IX. The following result is new: Under the influence of Valsalvan inflation the upper tone-limit is usually raised; frequently also the perception of the highest notes of the

scale is rendered more acute ; less frequently the pitch of the middle notes of the scale is altered. Aspiration, on the other hand, either does not influence the upper tone-limit at all, or lowers it somewhat.

X. Air-conduction for the fork c^{-1} is diminished both by auto-inflation and aspiration. In isolated cases the lower tone-limit is raised from c^{-1} to Des^{-1} .

In addition the two following results have been demonstrated in cases in which the inner wall of the tympanum was exposed :

XI. Increased tension of the annular ligament of the stapes through direct pressure upon the stapes augments bone-conduction.

XII. Tamponing the niches of both the labyrinthine windows does not influence the perception of high notes.

RESULTS OF THE FUNCTIONAL EXAMINATION IN CASES OF PURE CATARRH OF THE EUSTACHIAN TUBES.

BY. PROF. F. SIEBENMANN, BASEL.

Translated by Dr. E. B. DENCH, New York City.

BEZOLD found pure tubal catarrh in nine per cent. of his ear-patients. My own cases show about the same percentage. Thanks to the exhaustive investigations of Lucæ, Schwabach, Bezold, and others, we have advanced so far as to possess in the fine tests for hearing, *i. e.*, Rinne's and Schwabach tests, and the definition of tone limits, a knowledge of a completely characteristic reaction for the normal ear as well as for the pathological conditions known under the terms of nerve deafness, remains of a previous tympanic suppuration, and simple chronic otitis media. On the other hand, for tubal catarrh we have simply the two isolated reports of Bezold on this subject (see these ARCHIVES), which were limited to the observation of the hearing distance and the results of Rinne's test with two forks of low pitch. In the present paper I have undertaken to fill this want and to establish the variations from the normal condition as elicited by a functional examination in Eustachian catarrh. In this part of my paper I have sought to determine also the changes effected by the air douche in tubal catarrh, as evidenced by the difference in the results of the functional examination before and after its use.

In a large number of cases catheterization showed no secretion in the middle ear; the membrana tympani before

inflation was usually depressed, but there were no signs of inflammation. By inflation the membrane resumed its normal appearance and the hearing was improved in a marked degree.

We observed first the functional condition by testing the patients before inflation. The normal hearing distance for numbers of two figures whispered with residual air being 15 metres, in ten cases the whispering distance was 10 to 15 *cm*, in three from 101 to 150 *cm*, and in one case 500 *cm*. In Weber's test, when there was a marked difference in the whispering distance on the two sides the tuning-fork was referred to the poorer ear. The Weber-Schwabach test with A showed in all cases tested a marked increase in bone-conduction, varying from 10 to 19 seconds. Rinne's test, in which bone-conduction was tested from the mastoid process, gave a positive result in but two cases, notwithstanding as high a fork as *a'* was used, and even in those cases the result of the test showed a relative diminution as compared with the normal standard. In all the other cases Rinne's test gave negative results.

The upper limit always was below the normal standard. As tested with Galton's whistle, the limit was found to be 1.9 in those cases; six times it was between 2.2 and 2.9, and three times it was between 3.2 and 3.4. Tubal catarrh then lowers the upper tone-limit.

The lower tone-limit was tested with the Bezold-Katsch A^{-1} fork which by the application of clamps furnished a tone as low as C^{-1} as well as with the A fork of the above-named author. In only two cases was C^{-1} heard, and then very faintly. Three times the lower tone-limit was elevated to Des^{-1} , twice to F_{-1} , and twice to A^{-1} . In five cases this last fork was not heard, but the first fork heard was the A fork of our series.

Coming now to the second part of our work, we consider the second series of our tests, which represent the results obtained by functional examination, in each patient, after the use of the Eustachian catheter—that is, after the correction of the position of the ossicular chain resulting from aspiration.

The changes effected by the air douche in tubal catarrh, as evidenced by testing the patients after its application, are as follows : The hearing distance was markedly increased ; as above stated only cases were considered as belonging to this class in which marked improvement in the hearing upon both sides followed this procedure.

The result of the Schwabach test was only slightly altered by inflation, most frequently its value was somewhat increased, but sometimes decreased. The negative results obtained by Rinne's test were reversed, becoming positive in all but two cases ; in one case the result was ± 0 .

The upper tone-limit remained unchanged in five cases out of ten ; in one case the limit was slightly reduced, in another to a much greater degree ; in those cases the upper tone-limit was raised.

The lower tone-limit remained unchanged in two cases, in the remaining twelve it invariably was lowered by inflation. In six cases C^{-1} was the limit. In four of these last cases the number of seconds during which the note was heard was measured. From this it was determined that this time was reduced to from 9 to 7 seconds ; the normal average duration being $16\frac{1}{2}$ seconds.

The functional changes brought about by the application of the air douche are, shortly, as follows :

1. Improvement in air-conduction.
2. Augmentation of the lower tone-limit.
3. Shortening of the negative Rinne test, which may even become positive.
4. The upper tone-limit remains unchanged, or the changes are scarcely appreciable.
5. The same remark applies to bone conduction, which still remains stronger.

The cause of this last manifestation, persistence of increased bone-conduction, is, to my mind, partly due to the *hyperæmia ex vacuo* of the tympanic mucous membrane and of the deeper soft parts, which is always present in tubal catarrh. In consequence of this passive hyperæmia, the annular ligament of the stapes is also affected ; this rigidity fixes the stapes even after the "aspiration position" of the

ossicular chain has been corrected by inflation. Only later in the course of the disease does this rigidity of the annular ligament entirely disappear, as my cases prove. Hence the persistence of increased bone-conduction.

The above explanation serves also to solve another inexplicable phenomenon (see 4 above), that the upper tone-limit, which is lowered by affections of the Eustachian tube, is not immediately and completely restored. We can easily assume with Helmholtz that the portions of the scala vestibuli lying nearest the oval windows serve to effect the perception of the highest notes, and that these parts suffer also from the passive hyperæmia, and that this anatomical lesion cannot be removed immediately but only gradually.

In direct contrast to the condition found in cases of sclerosis, and in cases which have previously been the victim of suppuration within the tympanum, we find that in tubal catarrh, after inflation, in spite of the great degree of augmentation of bone-conduction, marked shortening of and even negative value of Rinne's test, and the notable narrowing of the tone-limits which still remain, air-conduction can still be relatively very good. Thus a patient under observation heard whispered speech upon the right side at 350 *cm*, although Rinne's test was negative and the lower tone-limit remained as high as A⁻¹.

We seek in closing to collect the chief results of our work.

I.—The test of bilateral tubal catarrh exhibits the following functional changes:

1. Diminution of air-conduction.
2. Increase of bone-conduction.
3. Localization of the tuning-fork placed on the vertex upon the more affected side.
4. Shortening of Rinne's test, or its reversal to negative.
5. Elevation of the lower tone-limit.
6. Reduction of the upper tone-limit.

II.—The first inflation does not notably influence either the increased bone-conduction or the reduction of the upper

tone-limit. On the other hand, it improves in no small degree the diminished air-conduction and the narrowing of the lower tone-limit, without restoring them to their normal standard. After the air douche the hearing is increased out of all proportion to the increased bone-conduction.

A CASE OF UNILATERAL TOTAL ABSENCE OF THE LABYRINTH CAUSED BY SCAR- LATINOUS OTITIS INTIMA.

By HOLGER MYGIND, M.D., COPENHAGEN.

AS total absence of the labyrinth is a very rare pathological condition, and also somewhat disputed as to its etiology, the following case might be of some interest, especially as the origin of this abnormality in the present case can be traced back with certainty to a special cause, viz., scarlatinous otitis intima.

Henning N—— was born on February 19, 1883, in one of the suburbs of Copenhagen. Both parents, who are not related to each other, are alive and healthy. Their hearing is normal, and there is not, nor has there been, any case of deafness, deaf-mutism, or any other infirmity of significance as to the etiology of the present case. They have had eight children, of whom the two youngest died as infants from unknown diseases. The deceased, Henning, was the fifth child, and had always been healthy and with normal hearing until three and a half years old, when he was attacked very severely by scarlet fever. He lay for nearly five weeks in a drowsy state, which was now and then interrupted by delirium. During this illness a discharge appeared from both ears, the father being, however, unable to state at what period of the fever this symptom appeared, or to give any other details, except that "a large abscess opened on the right ear and prevented it from being totally deaf." As stated before, the child's hearing was perfectly normal before this disease, but when the child recovered, the parents discovered that it could not hear as before. In this respect the father states that the child's hearing was very different at different periods, it being sometimes so

reduced that the boy was only able to hear words shouted loudly into his ears, while at other times he was able to hear ordinary speaking at some distance, and the father found that the hearing was especially bad when the air was heavy and depressing, and good when the air was light and clear. Further, the parents by degrees discovered that their son was able to hear only with the right ear, the left one being always totally deaf. The child's speech remained tolerably good.

At the usual age Henning N—— was sent to the ordinary school, but as he did not progress much on account of his deafness, he was sent to the Royal Deaf and Dumb Institution in Fredericia.

Here the child was admitted in September, 1891. It was stated then by the director of the institution, Mr. G. Jorgensen, to whom I am indebted for permission to examine the temporal bones of the deceased, that the child had a very fair amount of hearing, his speech also being very good, and the child was even able to sing a song so that the melody could be recognized.

Some time later a purulent discharge from the left ear was discovered. This discharge increased by degrees in quantity, and assumed also a fetid character, although disinfectants were employed frequently. There now appeared signs of inflammation also of the right ear, with redness and swelling of the mastoid region, where large incisions later on revealed pus and caseous particles. After this operation the process was apparently arrested on the right side, while the fetid purulent discharge continued from the left ear. The general health of the boy began to suffer considerably, and at last cerebral symptoms appeared, at first in the shape of convulsions, later on as a comatose state, during which the patient expired on April 4, 1892. As far as the hearing of the deceased during the latter part of his life is concerned, the medical gentleman in attendance, Dr. Chr. Langgaard, to whom I am indebted for the above particulars of the child's last disease, states that the child was able to hear very loud speaking directed straight into the right ear, but during the last five weeks before death the hearing was probably entirely lost.

On April 6th, about thirty-six hours after death, both temporal bones and the brain were removed and forwarded to me from Fredericia. The brain exhibited, by a superficial inspection, signs of purulent inflammation of the meninges, but became unfortunately spoiled from bad preservation.

AUTOPSY.

Left Temporal Bone.

The mastoid process.—The periosteum is easily detached ; the surface of the bone is very uneven and strongly congested. The whole mastoid process, except the apex, is occupied by a large cavity, the walls of which all over, except at the apex, consist of a thin layer of bone, and communicate through a large opening with the tympanic cavity, while it upwards communicates freely with another large cavity formed by the total destruction of the basis of the petrous bone. The roof of this large cavity consists of a bony layer, which is hardly 1 millimetre thick, and corresponds to the superior margin and the two superior faces of the petrous bone. The whole extension of this cavity is seen by the following measures : height, $2\frac{1}{2}$ cm ; lateral diameter, $1\frac{1}{2}$ cm ; antero-posterior diameter, $1\frac{1}{2}$ cm. The wall of this large cavity is moderately smooth in the upper part, while its inferior part is uneven, carious, and covered with granulations. The cavity contains a considerable amount of foul, greenish pus, enclosed by a thin, soft, cobweb-like pyogenic membrane.

The meatus auditorius externus.—The cartilaginous portion has a natural aspect, while the osseous part is the seat of an extensive carious process, which has only left upward a sharp edge, and downward a narrow bridge of bone.

Tympanic cavity.—The tympanic membrane is totally destroyed, neither does there exist any trace of the ossicula auditus, of the normal muscles, or of the chorda tympani. Anteriorly is seen the internal opening of the Eustachian tube, which does not exhibit anything abnormal. The posterior wall is almost entirely formed by a large opening, which represents the communication between the tympanic cavity and the large cavity described above, which occupies the greater part of the mastoid process and the external part of the petrous bone. The facial nerve, which exhibits a normal appearance, is normally situated in its bony canal. The tegmen tympani is considerably extenuated, its inferior surface being uneven and carious. On the internal wall of the tympanic cavity the promontorium appears of normal aspect. The fossula fenestræ rotundæ is present, but the fenestra itself does not exist as an opening, it being replaced by hard bone. The fenestra ovalis exhibits exactly the same appearance.

Labyrinth.—No trace whatever of the normal cavities of the labyrinth is to be found, the whole internal ear and its immediate surroundings being replaced by hard sclerotic bone tissue, in which not even the outlines of the labyrinth can be distinguished. The aquæductus cochleæ is entirely missing, its external aperture being only visible on the inferior face of the petrous bone. Apertura externa aquæductus vestibuli is also visible on its normal place, but this canal is otherwise entirely missing.

Meatus auditorius internus.—This canal does not exhibit anything abnormal. Its bottom presents its usual configuration, but there are no foramina cribrosa, the terminal branches of the acoustic nerve adhering to the solid bone which replaces the foramina. The appearance of the nerve itself is normal.

Right Temporal Bone.

Mastoid process.—This part exhibits the same abnormalities on the right side as on the left, the abnormal cavity being, however, somewhat larger, mostly on account of the apex of the mastoid process also forming a part of the cavity. The destruction of bone has also gone farther on this side, the wall, which corresponds to the sigmoid fossa being, in several places, perforated, the largest perforation being about 1 cm. wide and having rough carious edges. The result of this destruction is in this way a communication between the large abnormal cavity and the fossa cranii media. The walls of the right large cavity are all over considerably smoother than that of the left side, and lined in most places with a smooth epidermis-like membrane. The entire cavity is filled with cholesteatomatous masses, which consist under the microscope of numerous round cells, fatty particles, cholesterine crystals, and a few large flat cells containing one or more nuclei.

Meatus auditorius externus.—The anomalies found here do not differ essentially from those of the left side.

Tympanic cavity.—This cavity is filled with the same cholesteatomatous masses as described above. After the removal of these it is seen to be in general like the left tympanic cavity, —the tympanic membrane, the ossicula auditus, etc., also missing on this side. There is, however, one great difference, in as much as the right fenestra ovalis is present and of normal outlines, forming an open communication (without any fibrous tissue

closing the opening) between the tympanic cavity and the vestibule, through which opening the cholesteatomatous masses spread into the labyrinth. The fenestra rotunda exhibits exactly the same anomaly as that of the left side. The whole tympanic cavity is lined with a smooth epidermoid membrane which also covers a natural opening, about 2 *mm* wide, in the floor of the cavity leading to the jugular fossa.

Labyrinth.—The right internal ear differs considerably from the left, the normal cavities being all present on the right side. The membranous labyrinth is, however, entirely missing, the cavities being only filled with the same cholesteatomatous deposits as mentioned before. The *vestibule* does not exhibit anything abnormal. The *canales semicirculares* are all present and of natural appearance, except the posterior canal, which is somewhat flattened. The *cochlea* does not communicate with the tympanic cavity, the fenestra rotunda being, as described above, closed by a bony plate. The modiolus is entirely missing in the second and third turns of the cochlea, the upper part of this being in this way transformed into a cavity, in which remains of the natural parts of the cochlea are to be seen. There is no trace of the lamina spiralis ossea to be seen in the second half of the first turn of the cochlea, while it is naturally developed in the beginning of the first turn. The aquæductus vestibuli and cochleæ are normal.

Meatus auditorius internus.—No abnormality is present here. The auditory nerve appears healthy and terminates in the natural way.

REMARKS.

The greatest pathological interest connected with this case is the total absence of the labyrinth on the left side, on which, as it will be remembered, the deafness during the life-time of the patient had been complete since the attack of scarlet fever described above. The absence of the internal ear, which was so complete that no traces of the normal labyrinth cavities were to be found, seems to be—according to literature—a very rare pathological condition, this abnormality being up to the present only described by Montain,¹

¹ *Dictionnaire des Sciences Médicales*, Paris, 1819, tome 38, p. 114.

Michel,¹ and H. Schwartze.² Further, the catalogue of the Pathological Museum of the Copenhagen University describes the specimens Nos. 16 and 17 (representing left and right temporal bone of the same individual) belonging to the well known Ibsen collection of temporal bones from deaf-mutes, in the following way: "In both temporal bones the whole labyrinth is missing, pars petrosa forming a solid bony mass." This description is repeated in V. Bremer's,³ J. Mygge's,⁴ and my own⁵ reproductions of the said catalogue, but as a thorough examination and investigation on the occasion of the present paper yielded another result, and also revealed another error concerning these specimens, I think they deserve a short mention. According to Mygge's investigations these two specimens originate from a male deaf-mute, born in 1819 and deceased as a pupil of the Royal Deaf and Dumb Institute of Copenhagen in 1827, and said to have been born deaf, and to have had two deaf and dumb brothers or sisters. An examination of these two specimens shows, however, that the left fenestra ovalis leads into a small hour-glass shaped cavity, the situation and height of which correspond to those of the vestibule; further, a small opening corresponding to the fenestra rotunda leads into another small cavity, which cannot be closer examined on account of the way in which the preparation of the specimen is made, but the situation of which undoubtedly corresponds to that of the first turn of the cochlea. In the petrous part of the right side, where a horizontal section parallel with the axis of the petrous part is made only through its middle (the tympanic cavity being besides opened from above), a small three-cornered cavity is seen where the vestibule ought to be, and this cavity communicates with the tympanic cavity through a narrow

¹ "Mémoire sur les Anomalies de l'Oreille Interne," etc., *Gazette Médicale de Strassbourg*, 1863, p. 57.

² "Beiträge zur Pathologie und pathologischen Anatomie des Ohres," *Archiv für Ohrenheilkunde*, Bd. v., p. 296.

³ *Om det pathologiske Fund hos Døvstumme*, etc., p. 108.

⁴ "Nogle Bemaerkninger om Studiet af Døvstumhedens Ætologi," etc. *Ugeskrift for Læger*, 4th series, vol. ii., p. 22.

⁵ *Die angeborene Taubheit*, p. 51; and "Uebersicht über die pathologisch-anatomischen Veränderungen der Gehörorgane vom Taubstummen," *Archiv für Ohrenheilkunde*, Bd. xxx., p. 86.

opening, situated in the place of the fenestra ovalis. On both sides the bone which has partially replaced the normal cavities of the labyrinth is very white and hard, being distinctly, though without any sharp outlines, separated from the surrounding bone of the petrous part. It will be seen then that these specimens do not exhibit an entire absence of the labyrinth. Further, as the pathological condition of the said specimens gave me the impression of being due to post-foetal processes, I investigated their origin by means of the official books of the Royal Deaf and Dumb Institution, and found that a mistake had been made, as they originally were taken at the post-mortem examination from a male deaf-mute born 1811 and dead 1817, who had become deaf from an unknown disease when four years old.

In the case of H. Schwartze mentioned above, the labyrinth of the left side was, as in the present case, entirely substituted by solid bone, so that no trace of the internal ear could be detected; on the right side the normal cavities of the labyrinth were replaced by fibrous tissue. According to the report of the father of the deceased child, it had become deaf from meningitis during the fourth year of its life, but Schwartze doubts the abnormalities described to be of post-foetal origin. There can, however, at present be no doubt that inflammatory processes of the internal ear developed after birth can result in the formation of bony tissue, which can to a more or less degree replace the normal cavities of the labyrinth—a fact I have pointed out in several previous papers.¹ The present case, where the reliability of its history is beyond any doubt, and also confirmed by the pathological changes found in the middle ear, is another proof of the correctness of this opinion, and proves besides that the bone tissue, which is formed as a produce of a post-foetal otitis intima, is able to fill up the normal cavities of the labyrinth so thoroughly, and assume the appearance of the surrounding bone so completely, that

¹ "Uebersicht über," etc., *Archiv für Ohrenheilkunde*, Bd. xxx., pp. 113 and 118; Larsen and Mygind, Ein Fall von erworbener Taubstummheit, etc., *ibid.*, 196; "A Case of Deaf-Mutism from Measles," etc., these ARCHIVES, vol. xx., p. 318.

every trace of the outlines of the original cavities disappears entirely.

It must, however, be remembered that the total absence of the ear-labyrinth may also be due to foetal pathological changes, of which the case observed by Michel, and mentioned above, is an incontestable proof. In this case, where the labyrinth was entirely missing on both sides, the whole petrous part was deformed, it having only two faces, a superior and an inferior, besides which other congenital malformations were present, among which is especially to be mentioned the total absence of both acoustic nerves. In the case described by Montain and quoted above, the deceased child was said to have been born deaf; according to the short description, the entire labyrinth was absent (on both sides?), which was also the case with the ossicula auditus—a circumstance which, together with the fact that the tympanic cavity was filled with “mucilaginous matter,” seems to make the correctness of the history of the case doubtful.

That the labyrinthine inflammation, of which the formation of bony tissue on the left side was the result, has been secondary to an inflammatory otitis media, is highly probable.¹ The considerable destruction of the normal contents and the walls of the tympanic cavity on both sides seem to prove that the primary inflammation has been very intense. It must, however, be borne in mind, that scarlatinous labyrinth affection in many cases is less due to the intensity of the middle-ear disease than to its special character. Clinical experience and numerous otoscopical examinations of deaf-mutes show anyhow that the primary middle-ear disease not unfrequently is, or has been, comparatively mild. There is even reason to believe that this intermediate link is not necessary for the production of the otitis intima—a circumstance which is especially mentioned by A. Hartmann² and H. Schmaltz.³ The labyrinth inflammation

¹ Compare “Rare Anomalies, both Congenital and Acquired, Occurring in the Ears of a Deaf-Mute,” by S. Moos, *Arch. Ophthal. & Otol.*, vol. ii., part 1, pp. 139-158.

² *Taubstummheit und Taubstammenbildung*, p. 79.

³ *Die Taubstummen im Konigreich Sachsen*, p. 63.

might then in such cases, where there is no primary inflammation of the middle-ear, be considered as the product of metastasis, the otitis intima being in this way similar to other diseases arising during an attack of scarlatina,—for instance, the scarlatinous nephritis.

That the scarlatinous otitis intima may end in the formation of bone tissue is quite recently proved by post-mortem examinations of S. Moos¹ and Uchermann.² Moos explains the morbid changes found by him in the labyrinth as the result of the immigration of micro-organisms into the endosteal vessels of the internal ear; by this process are produced, on the one side necrosis and destruction of the tissue, on the other side formation of osseous tissue through irritation of the endosteum. The observation of the two cases of S. Moos and Uchermann, together with the present, then, proves that the scarlatinous otitis intima is of a similar nature as the labyrinthitis caused by measles³ and cerebro-spinal meningitis.⁴ This circumstance seems also to speak in favor of the theory touched upon above, viz., that scarlatinous labyrinthitis arising secondary to an otitis media is rather the result of the special character of the primary middle-ear inflammation, than of the intensity of the latter disease.

The critical remarks made in the preceding pages apply principally to the morbid changes observed in the left ear of this case. As far as the abnormalities of the right ear are concerned, the circumstance that the deceased, until some weeks before death, was able to hear fairly well, at least at periods, shows that the destruction found in the labyrinth must, at least principally, be considered as caused by propagation of the cholesteatomatous masses from the tympanic cavity through the fenestra ovalis. There is, however, one pathological change, which undoubtedly has not been

¹ "On the Histological Conditions," etc., these ARCHIVES, this No.

² "Anatomischer Befund in einem Falle von Taubstummheit nach Scharlach," these ARCHIVES, Germ. Ed., vol. xxiii., p. 70.

³ S. Moos, "Untersuchungen über Pilzinvasion des Labyrinths im Gefolge von Masern," these ARCHIVES, vol. xviii., p. 49; and Mygind, "A Case of Deaf-Mutism Caused by Measles," *ibid.*, vol. xx., p. 310.

⁴ Larsen and Mygind, "Ein Fall von erworbener Taubstummheit mit Section," *Archiv für Ohrenheilkunde*, Bd. xxx., S. 188.

caused by a process developed in the latter part of the patient's life, viz., the closing of the fenestra rotunda by a plate of hard osseous tissue, the pathological conditions being exactly the same in both ears and beyond any doubt very old. This fact is of considerable physiological interest, as it, together with the history of the case, proves that a considerable degree of hearing (at least at intervals) might be left after a post-foetal closing of the fenestra rotunda by an osseous plate. This observation tends, then, to show that the existence in the foramen rotundum of a movable membrane is not so essential to the hearing as generally accepted, according to the theory that the undulations of the labyrinthine liquid caused by the movements of the stapes in the fenestra ovalis during hearing are principally regulated by the membrana tympanica secundaria. There seems reason to believe that in the present case the stapes had been present until a short time before death, as the amount of hearing observed on the right side during the patient's life could not very well be present when the stapes and the membrana tympanica secundaria were absent.

The meningitis observed during the life-time of the deceased patient, and revealed by the post-mortem examination, can easily be explained by the fact, that there was an open communication between the large cavity filled with fetid pus and the fossa cranii media on the right side. The circumstance that the boy had no rational treatment prior to his admission to the Deaf and Dumb Institution is undoubtedly responsible for the fatal termination of this case.

AN APPARATUS OF PRECISION FOR INFLATING AND MEDICATING THE TYMPANUM.

By THOMAS HUBBARD, M.D., TOLEDO, OHIO.

(With an Illustration.)

POLITZERIZATION has long been the central figure of progress in aural therapeutics. The advance in differential diagnosis in aural diseases has established new indications and limitations for inflation of the tympanum, but we are still largely dependent upon the method of Politzer or some of its modifications. It is my purpose briefly to describe an apparatus, based on the essentials of the Politzer method, that has been gradually developed as the result of practical observations to meet certain clinical demands.

It is obvious to all that the ordinary method of politzerization is, in its details, unsurgical, in so far as liability of introducing septic air-dust into the middle-ear tract is concerned. Also, from a therapeutic standpoint, it is highly important that the air used should be not only non-irritant, but it should be properly warmed and medicated. And it adds to the scientific and practical value of this procedure if it is possible to control and record the degree of tension required for thorough inflation.

It was with a desire to obviate the objectionable features above enumerated, and make such improvements as are suggested, that the apparatus to be described was constructed.

A compressed-air tank is necessary—and I prefer one of large size and low pressure (eight to ten pounds). The air from the tank is cleansed by passing through one or more

wash-bottles containing glycerine before it reaches the inflation apparatus. This latter consists of a quart flask mounted in horizontal position on a suitable standard. At one end is an opening to receive a double perforated rubber cork, through which are inserted the tip of a Devilbiss atomizer and the curved muzzle of a Politzer air-bag. At the other end are two openings, the one being connected by rubber tubing with a manometer, and the other carrying the nasal piece (the large bulbous tip preferred). The compressed, cleansed air is conveyed to the atomizer by rubber tubing having a Devilbiss cut-off near the atomizer so arranged that one hand can manipulate both the cut-off and the Politzer air-bag.

The manometer is of the simplest possible construction. It is made of a U tube of about two millimetres diameter of calibre, each arm being about ten inches long, having a scale graduated in inches from the point of equilibrium between the two columns of mercury. It should of course hang perpendicularly. One pound pressure is represented by two inches of mercury, referring of course to pounds per square inch.

To operate the apparatus it is first necessary to heat the water in the flask or pour in hot water, medicated or not as may be desired. The fluid in the atomizer cup should also be hot. The tubes having been connected as directed and the cut-off opened, a cloud of vapor emerges from the nasal piece. The patient is directed to take a little water in the mouth, and, the nasal piece having been inserted and the other nostril closed, he should inhale the vapor until the upper air passages are filled. As the order to swallow is given the operator should watch the manometer and with the hand note the degree of pressure in the air-bag. The cut-off should be kept open, and by careful manipulation of the air-bag the degree of pressure can be regulated accurately. In most patients it will be possible to sustain the pressure for several seconds. If the operator have any fear of over-inflation the air-bag may be held half compressed, thus allowing some room for expansion and relief of pressure if it approach a dangerous degree. Experience soon fixes

the range of pressure in individual cases. The Eustachian catheter can readily be substituted, and direct inflation practised with equally reliable registration of air-tension.

A brief review of the special features of this method of inflating the tympanum may now be in order.

The air entering the Eustachian tube is warm and medicated. This does away with the element of spasmodic resistance due to the shock of the cold air douche. The impact within the tympanum is less violent, since the comparatively large volume of air under compression (in flask and air-bag) imparts a considerable degree of elasticity. The shock is lessened very materially by the fact that the manometer is in connection with the volume of compressed air, the yielding mercury column serving as a safety valve, as it were. Thus the latter may be said to add two desirable features—that of scientific accuracy and safety. Intelligent patients will often so retard the act of swallowing that the pressure can be maintained for several seconds, and I have occasionally been able to see the vapor issue from the external auditory meatus in cases of dry perforations. Where there is pus within the tympanum continuous pressure cleanses more thoroughly than sudden momentary inflation.

The aseptic feature recommends itself, and especially in suppurative cases running a natural course, where it is desirable to displace the pus from the tympanum and yet not introduce any new septic germs.

By the substitution of a small tip for the nasal piece the aseptic medicated vapor can be directed into the Eustachian catheter, which latter should of course be sterilized before introduction. An intelligent patient can adjust the nasal piece properly, and the operator can then inspect the drum-head during the act of inflation (with or without catheter) and secure reliable information as to its condition, presence of adhesions, etc.

It is observed that the manometer is in direct and free connection with the vapor flasks. We are positive then that we have a reliable index of the pressure exerted within the apparatus and the nasal passages. When the inflation of the tympanum is a single brief impulse we cannot measure

the tension so accurately as where it is maintained over a few seconds, as usually obtains in the method described, since the supply of compressed vapor is continuous. We can feel confident that we have a correct reading of the pressure within the Eustachian canal and also the tympanum when positive that it has penetrated to the tympanum. It is at least certain that the pressure can at no point be greater than that indicated by the manometer.

A maximum pressure of ten pounds in the compressed-air tank has been referred to as the limit of safety. The apparatus can be so modified that any desired pressure can be tolerated, but there is really no object in using a higher pressure than ten pounds, provided the conducting tubes etc. do not produce too much friction in the air current, thus materially reducing the initial pressure. It may be said in explanation that I always measure the air pressure *at the cut-off*, thus getting the actual pressure used, so that the question of friction in the conducting tubes can be ignored.

As regards the degree of pressure within the inflation apparatus we find that in ordinary cases less than two pounds is sufficient to inflate the tympanum. Generally one and one half pounds' pressure suffices, and in many cases one pound or less produces the desired effect. Usually we can take the patient's word, or accept the description of the sensation, as proof of penetration, but the diagnostic tube gives the most satisfactory testimony of the condition of the canal and tympanum. The position of the head has considerable influence in the patency of the Eustachian orifices. By turning the head to the extreme right the left orifice is made patulous, and *vice versa*.

The water in the flask can be medicated as desired. The addition of oil of tar, eucalyptol, or iodine would meet special indications. Wine of ipecac and terebene have also been used. Iodide of ethyl and menthol suspended in oil of vaseline have a most agreeable effect when sprayed into the flask and then forced onward into the tympanum. The Devilbiss drop-cup atomizer is best adapted to this apparatus, since it requires but moderate pressure to produce a

An Apparatus of Precision for Inflating and Medicating the Tympanum.

A = Atomizer
C = Cut-off
F = Vapor-flask
M = Manometer

N = Nasal piece
P = Politzer air-bag
W = Glycerine wash-bottle

fine spray of medicated oil of vaseline. The steam from the vapor flask tends to make more permanent the fine oil spray.

The vapor flask was constructed for me by A. Devilbiss, Jr., Toledo, O.

ON FIVE CASES OF OTITIC BRAIN ABSCESS WITH A SHORT DESCRIPTION OF OTITIC BRAIN ABSCESES IN GENERAL.

By H. HEIMAN, WARSAW.

Translated by Dr. WARD A. HOLDEN.

THE brilliant results obtained by English and German surgeons in the domain of the operative treatment of brain abscess has lately awakened the general interest of surgeons and otologists, and on all sides there has been an endeavor to render more certain the diagnosis of this important and dangerous disease. It must, however, be confessed that, notwithstanding all the efforts made, we are still far from being able to make a positive diagnosis in all cases. In the solution of the question, it seems to me that a report of every case observed may be of value in giving new signs by which an early diagnosis may be made. With this view the following paper was written.

CASE 1.—M. J., æt. twenty-three, was received into my department March 23, 1888, with a chronic otorrhœa on the right side. For three weeks he had had a severe continuous headache on the right side, with complete loss of appetite. The anæmic and emaciated patient found the recumbent posture the most comfortable. A change of position at once brought on giddiness. The right parietal and frontal region is sensitive on percussion, and the latter increases the headache. The patient is conscious, but his answers are slow, and he is apathetic. The pupils are contracted, but respond readily to light; photophobia; cutaneous and joint reflexes increased; tongue dry, blue, and tremulous; anorexia; temp. 37.2° ; otorrhœa; central perforation both

Mtt. Hearing diminished ; osseous conduction preserved. The patient had 1.0 of calomel and an ice bag to the head. Condition unchanged until March 29th.

March 30th.—Vomiting, pulse 52, temp. 37° . The patient would take no nourishment voluntarily and was given milk through a tube. The apathy is increased, and the patient sleeps almost continuously. Otherwise the symptoms are as before. Antifebrin had no effect upon the headache. The patient remained in this condition until April 6th.

April 7th.—Pulse 44, thready, and intermittent ; temp. 36.5° ; semi-comatose condition. Extremely severe diffuse headache, causing groans.

April 8th.—Pulse 72, temp. 36.5° . The patient rises in bed. Ptosis of left upper lid, contraction of right pupil, stasis in the retinal vein of both eyes, paresis of right facial nerve, constipation, moderate purulent discharge from both ears.

Pot. iodid. given. The local and general condition remained the same until April 12th, when the temp. was 37.4° , and the pulse 80. Both pupils dilated, left more than right, both reacting sluggishly to light. Paresis of the right limbs. The patient does not speak, but drinks milk eagerly. No particular change occurred until April 22d, when the temp. was 38.3° , pulse 64. Severe headache ; marked ptosis of right upper lid. Slight twitching of the left limbs ; mind dull. The patient talks slowly to himself. A disagreeable odor from the mouth ; tongue dry. The smallest quantities of fluid are at once vomited. Involuntary passages of urine and fæces. Heart's action weak. The condition remained the same until the following day when the patient died.

Diagnosis: Chronic otitis media purulenta, both sides ; cerebral abscess in right frontal lobe.

Autopsy: The dura mater is pale and tense. After its removal the surface of the brain appears pale and œdematous, the convolutions are flattened, and on the right side are very indistinct. When the brain was removed 100 *grm* of fetid green thinly fluid pus with flocculent fibrinous masses escaped from the interior. The right hemisphere contained a large encapsulated abscess cavity which involved the temporal, the parietal, and in part the occipital lobe ; internally it extended to

the optic thalamus. The lateral ventricles contain some serous fluid. The cerebral substance surrounding the abscess is healthy. At the spot where the abscess burst, the brain is adherent to the dura of the temporal bone. The dura from the petrous portion of the temporal bone after its removal is seen to be thickened and perforated. The corresponding spot in the temporal bone is rough and has a small carious opening which leads directly to the tympanic cavity. In the latter there is some pus, and the mucous membrane is ulcerated at some points.

When the patient was first admitted to the hospital the diagnosis was uncertain between meningitis and cerebral abscess. Three days later the symptoms pointed to abscess. The abscess however, for reasons not under my control, could not be opened. Death followed from œdema of the brain, but chiefly from general debility, interference with important cerebral functions, and general atrophy. The case almost reached its termination before fever came on.

CASE 2.—J. B., æt. twenty-two, a Cosack, came under my care May 13, 1888, with otorrhœa, deafness, and pain in the head on the right side. Six months before, he fell from a horse and sustained a slight contusion of the head, and immediately thereafter a muco-purulent discharge commenced in the right ear and lasted some weeks. After this the patient was well until a week ago when the symptoms mentioned above appeared. The right *Mt* is opaque and retracted in the centre; after politzerization it bulges forward. $H : L \div \frac{1}{2} 24$; $V = \frac{6}{80}$. Severe pain in right side of head, left ear healthy, no fever. Pulse 72. The patient is strong and well nourished. Potass. brom. was given. This condition remained the same, there being but little headache, until May 26th, when the right *Mt* became perforated and a muco-purulent discharge appeared. Four per cent. boric acid was dropped into the ear. June 12th, the discharge ceased and soon after pain commenced in the right mastoid, which was worse upon pressure. Temp. 38° C., pulse 90. Mastoid pencilled with tinct. iodine.

June 13th.—Temp. 37.7° , pulse 84. Mastoid tenderness less marked. Evening temp. 38° .

June 14th.—Temp. 38° , pulse 84. Moderate muco-purulent discharge from right ear and tenderness of right temporal region. Constipation. Four leeches applied to right mastoid. Infus. sennæ comp. given. Evening temp. 38° , pulse 78.

June 15th.—Temp. 38.4° , pulse 90. Otorrhœa ceased; pain in

right side of head; mastoid not tender. Cutaneous and tendon reflexes increased. Patient feels dull. Evening temp. 40° , pulse 90.

June 16th.—Temp. 38.2° ; pulse 60, full and hard. Pain in right temporal and occipital region increased by percussion. The patient prefers the recumbent posture. Movement causes nausea and giddiness. Wilde's incision made. Ice-bag applied to head. Calomel and jalap given internally, causing some passages, after which the headache diminished. Evening temp. 38° , pulse 60.

June 17th.—Temp. 38.6° , pulse 72. Evening temp. 39.5° , pulse 84.

June 18th.—Headache severe again. The tongue is coated and is tremulous when protruded. Pupils evenly contracted, but responsive to light. Fundus normal. At 4 P. M., severe chill, lasting two hours, with very severe headache. Evening temp. 39° , pulse 60.

June 19th.—Temp. 38° , pulse 66. Evening temp. 39.7° , pulse 84.

For the last four days the headache was particularly severe late in the afternoon. Antifebrin lessened it somewhat. From June 23d to June 28th there was no fever, and the pulse varied between 60 and 70. The headache was not so severe.

June 28th.—Temp. 38.2° , pulse 72. No fever again until July 4. Pulse varied between 60 and 84. The headache was localized as mentioned above.

July 5th. Temp. 37.5° , pulse 60. Change of posture causes excessive giddiness. The right pupil is dilated. Evening temp. 38.2° , pulse 62.

July 6th.—Temp. 38.1° , pulse 90. Evening temp. 39.6° , pulse 96. Severe pain in right side of head.

July 7th.—Temp. 38.5° , pulse 100. Evening temp. 38.6° , pulse 100. At night severe chills and almost unbearable headache. Antifebrin had no effect.

July 8th, 9th and 10th.—Temp. 37.5° . Evening temp. 37.4° , pulse 90.

July 10th.—Severe chill, increased pain in head. Temp. 39.5° at time of chill.

Until July 18th the condition remained unchanged. Temp. from 37.2° to 38.2° , pulse 72 to 68.

July 19th. Temp. 36.8° , pulse 66. Severe pain in parietal region. Nausea and vomiting. Continued constipation. Cutane-

ous and tendon-reflexes diminished. Evening temp. 37.6° , pulse 64.

July 20th.—Temp. 37.3° , pulse 62. At night patient restless, unconcious, and delirious for some hours. Consciousness has returned. Patient apathetic. He speaks slowly and unwillingly. Severe blepharospasm. Right pupil contracted. Lower extremities partially contracted and stiff. Complete loss of appetite. The operation, which I had urged several weeks before, was still put off.

July 21st.—Temp. 37.3° , pulse 48.

July 22d.—Temp. 37° , pulse 48. Patient conscious and speaks slowly. Paresis of right facial nerve. The entire skull sensitive on percussion. Change of posture increases the spontaneous headache, so that the patient holds his head in both hands and groans. When raised he falls back upon the left side. The ear again shows a muco-purulent discharge. At night the patient is delirious and has convulsions. This condition soon became one of absolute coma and the patient died July 23d.

Diagnosis: Subacute purulent otitis media, right; abscess of right frontal lobe of the brain.

Autopsy: The dura of the calvarium is pale. The surface of the brain is œdematous. The white substance of the right temporal and occipital lobes contains two abscesses, the one in the temporal lobe the size of a pigeon's egg, and that in the occipital lobe the size of a walnut. Both are encapsulated and are filled with fluid, green, offensive pus in which are a number of fibrinous masses. They are separated from each other by 2 cm of healthy brain substance. The inferior surface of the cerebellum is covered with the same pus. The dura above the right petrous portion of the temporal bone is thickened, and above the tegmen tympani a bit of gray cerebral substance, 1 cm sq., is adherent to it. The transverse sinus contains fluid pus. After being removed from the petrous portion of the temporal bone, the dura is seen to be thickened and perforated. The bone shows two dark softened points through which a sound can be passed into the tympanic cavity. The tympanic cavity contains inspissated pus.

In this case, which ran a classic course, one of the abscesses burst into the cranial cavity. The abscess was com-

plicated with purulent thrombo-phlebitis of the transverse sinus. It opened into the cranial cavity apparently at the spot where the brain was adherent to the dura, although a direct connection between the abscess and the petrous portion of the temporal bone could not be discovered at the autopsy. The operation was postponed too long, but it would have been unsuccessful, since the second abscess had not been suspected. The case presented no diagnostic difficulties.

CASE 3.—M. G. æt. twenty-four, was admitted Aug. 26, 1888, with severe pain in the right ear and right side of head. The patient had suffered with periodic otorrhœa, right, since childhood. Six days before, the discharge had commenced again and continued four days, when it ceased, at which time severe pain appeared in the right side of the head. In the right *Mt* is an old dry perforation. The mastoid is not painful. Air- and bone-conduction preserved. Left ear normal. Percussion of the right temporal and occipital regions causes some pain. Both pupils are moderately dilated, but respond to light; fundus normal. The patient prefers the recumbent posture, as sitting up or walking increases the headache and causes nausea and vomiting. The patient is weak and apathetic, but answers readily all questions. The tongue is moist, blue, and tremulous. No appetite. Bowels regular. Temp. 38.3° ; pulse 90, full and hard. Besides a slight enlargement of the spleen nothing pathological was found. Four leeches were applied to the right mastoid, an ice-bag was put on his head, and infus. sennæ given internally.

Aug. 27th. — Temp. 39.2° , pulse 90, resp. 16. Intermittent piercing pain in the right temporal region; the tip of the right mastoid sensitive. Ear dry. The patient rises up in bed easily, but soon feels giddy. Evening temp. 39.4° , pulse 60. At 11 o'clock in the evening severe pain developed suddenly in the right half of the head, excepting the frontal region. Following this there were vomiting, delirium, convulsions in all the limbs, coma, cyanosis, and Cheyne-Stokes respiration, and the patient died in the morning of Aug. 28th.

Diagnosis: Chronic dry perforation of right membrana tympani. Circumscribed external meningitis of right side. With the appearance of the late symptoms, a rupture of a cerebral abscess was diagnosed.

Autopsy: The dura is pale, surface of brain œdematous. The right lobe of the cerebellum is adherent at some points to the dura. There are two small fistulous openings in its surface, which lead into the interior of the lobe, where there is an incapsulated abscess the size of a pigeon's egg, containing an offensive green thinly fluid pus with fibrinous flakes. The neighboring portion of the cerebellar substance is soft and œdematous. The lateral ventricles both contain great quantities of serous fluid. The inner surface of the dura covering the petrous portion of the temporal bone is coated with thinly fluid offensive pus and fibrinous masses. There is a considerable collection of pus between the dura and the bone. The pus communicates with the transverse sinus through an opening in the latter. In the sinus is a thrombus, red externally, nearer the centre yellow, and in the centre consisting of pure pus. The surface of the pyramid which corresponds to the tegmen tympani is rough, and has two openings which lead directly into the tympanic cavity. The latter contains inspissated caseous pus. The mastoid is intact.

The symptoms might have indicated a cerebral abscess, but might also have occurred with a purulent middle-ear inflammation or with a circumscribed meningitis. A cerebellar abscess was the last thing to have been suspected. The otitis led to caries of the tegmen tympani, to an extradural and then to a cerebellar abscess, which latter at a late stage was complicated with thrombo-phlebitis of the transverse sinus. Death was caused by acute œdema of the brain and hydrops of the ventricles.

CASE 4.—P. T. æt. twenty-four, was admitted Nov. 26, 1891, for a left otorrhœa of seven months' duration. Patient has performed his ordinary duties and has had no medical treatment. Ten days ago severe pain began in the left mastoid and grew worse daily until two days ago, when, with the appearance of a tumor at the painful spot, it ceased. The left temporal region and the left eye are œdematous. The left external canal contains a quantity of green pus. The upper wall of the canal is bulging, narrowing the lumen so much that inspection of the deeper parts is impossible. The existence of a perforation was shown by inflation. At the upper margin of the mastoid, close to the insertion of the auricle, is a fluctuating tumor the size of a

walnut. The skin is red. Air- and bone-conduction are preserved, but diminished on the left side. The head is free, there being no points sensitive to percussion. Both pupils are equally large, and both react to light. Fundus normal. The patient feels well, but is somewhat dull and weak. The appetite is good, bowels regular, tongue coated. Temp. 37.6° , pulse 84. Nothing abnormal was found in the other organs. The fluctuating part was opened by a Wilde's incision. Twenty *grm* of thinly fluid, greenish, offensive pus escaped. Pressure in the temporal region emptied a quantity of pus. The mastoid and a part of the squamous portion of the temporal bone were laid bare, but were intact. The wound was cleaned with bichloride solution (1-1000), filled with iodoform gauze, and bandaged. Evening temp. 37.8° , pulse 86. The dull feeling continued.

Nov. 27th, the following day—Temp. 39.5° , pulse 100. The patient is cheerful although somewhat dull. The moistened dressing was changed. Considerable pus came from the wound.

Nov. 28th.—Temp. 39.50° , pulse 108. The patient sat up in bed and conversed, when suddenly an unbearable headache came on. With this there was a chill and vomiting. In some minutes the patient lost consciousness. Both pupils were very large and did not respond to light. The bulbar conjunctiva lost its sensibility. The lips were covered with frothy mucus. The face was cyanotic. Cheyne-Stokes respiration. Paralysis of all extremities. All reflexes wanting. Pulse 88, tension of vessels low. The wound behind the ear is dry. In this condition the patient died the same day.

Diagnosis: Chronic purulent otitis media, left, abscess of mastoid process. Rupture of cerebral abscess into lateral ventricle.

Autopsy: The blood-vessels of the dura are hyperæmic, the dura itself normal, the arachnoid tense. A greenish-yellow fluid is seen in the sulci. The brain is adherent to the dura at the posterior surface of the left petrous portion of the temporal bone. The base of the skull is covered with a purulent fluid. The left temporal lobe shows a small fistulous opening on its lower surface, which leads into the brain substance. Slight pressure on the surface of the brain causes green thinly fluid pus to trickle through the fistula. In the white substance of the left temporal lobe is

a capsulated abscess cavity the size of a pigeon's egg. The surrounding brain substance is œdematous and somewhat soft. The capsule has an opening which leads into the left lateral ventricle. The latter contains a quantity of pus. Macroscopically the pus from the Wilde's incision, from the base of the skull, from the abscess, and from the ventricle was similar. The *staphylococcus pyogenes aureus* and *streptococcus* were found in all. The remainder of the cerebral hemispheres is anæmic. The cerebellum, corpus callosum, and medulla are normal. In the superior longitudinal, the transverse, and the superior and inferior petrosal sinuses there is dark fluid blood. After removing the dura from the bone it is seen that the plug of pus fills a perforation in the dura about 4 *mm* square. The dura is much thickened and its outer surface is covered with pus and fibrinous masses. The corresponding portion of the bone is also covered with pus, and in the tegmen tympani is a small carious perforation, surrounded with rough and blackened bone, leading into the tympanic cavity. The mastoid process and the remainder of the temporal bone are normal. The internal ear and the porus opticus as well as the auditory nerve are normal. The mucous membrane of the tympanic cavity on the left side is thickened, red, and is easily detached from the bone.

In this case, which in its course simulated an acute purulent periostitis of the mastoid process complicating an otorrhœa, no suspicion of the severe cerebral disease was aroused, and the diagnosis was made only when the abscess discharged into the lateral ventricle. The patient's dulness was marked, but from this symptom alone we cannot make a diagnosis of cerebral abscess. Only the late symptoms left no doubt as to the nature of the disease. The immediate cause of death was the discharge of pus into the left lateral ventricle, the symptoms of which may simulate those of apoplexy, when there has been no aural affection and the patient has not been observed previously. One point should be noticed, viz., that the pus in the abscess, that at the base of the skull, that in the lateral ventricle, and that in the mastoid, presented the same characteristics, and therefore it is reasonable to suppose that the contents of the mastoid abscess came directly from the cerebral abscess. But as the

temporal bone was found to be sound, and there was no connection between the tympanic cavity and the subcutaneous tissue of the mastoid region, and as there was no pus in the normal openings that connect the cranial cavity with the external skin, the path of the pus from the cerebral abscess to the mastoid region is not clear. Perhaps it was the large emissary at the junction of the three sutures (asterion).

CASE 5.—N. K., æt. twenty-four was admitted Jan. 2, 1892, with an otorrhœa on the left side, which began two years previously without assignable cause. The patient is extremely emaciated. The entire body is covered with scorbutic patches. He is apathetic, speaks with an effort, lies recumbent on his right side. Walking or sitting up is difficult. The left pupil is contracted; the lower branches of the left facial nerve are paretic. Percussion of the skull is not painful. Considerable discharge of pus from the left ear; the *Mt* shows a large, old perforation; the mucosa of the tympanic cavity is ulcerated, and in the depth of the cavity are inspissated purulent masses, which are adherent to the walls. Air- and bone-conduction are preserved in both ears. Temp. 36.9° ; pulse 56, and weak. Loss of appetite. Bowels normal. Evening temp. 37.1° , pulse 54.

Jan. 3d.—The patient complains of pain in the left ear. Vomited once. Temp. 36.9° , pulse 50.

Jan. 4th.—Temp. 36.8° , pulse 50. Excessive discharge from left ear. Left mastoid and neighboring temporal region sensitive on percussion. These parts were pencilled with tinct. iodine, and potass. iodid. was given internally. Evening temp. 36.4° , pulse 48.

Jan. 5th.—Temp. 36.1° , pulse 42. The patient feels weak and apathetic, and lies in bed on the left side the entire day. Paresis of the right extremities was observed. The sensibility of the right leg and arm was reduced. The patient cannot walk without assistance, and drags the right leg. The fundus is normal; the pupils react well. There is no spontaneous headache, but it is brought on by percussion of the left mastoid. Vomited twice. Bowels regular. Evening temp. 36.9° , pulse 40.

Jan. 6th.—Temp. 36.2° , pulse 36, resp. 20. The patient is half comatose. The symptoms of the preceding day are increased. An operation was decided upon, and was performed at

3 P.M. An opening 4 mm square was made by trephining at a point 1 cm above and anterior to the superior margin of the auricle. The dura was pale and did not pulsate. The cerebral substance beneath the dura was of a pale yellowish color, and protruded somewhat. A knife was passed 4 cm into the cerebral substance. After introducing a canula, 60 grm of green thinly fluid offensive pus escaped. Passing the finger into the wound an abscess cavity the size of a goose egg was discovered, with an irregular wall, reaching inferiorly to the temporal bone, though this was not left bare. A drainage tube was introduced and the cavity filled with iodoform gauze. Soon after the operation the patient regained consciousness, and talked. Evening temp. 37.8°, pulse 20, resp. 20. He soon relapsed into a half-comatose condition, both pupils being moderately contracted.

Jan. 6th.—Temp. 38.9°, pulse 76–84. Restless at night, feels well but has headache. Paresis of right extremities somewhat less. The otorrhœa is as before. Gauze removed and wound syringed with 1:2000 bichloride solution. Evening temp. 38.5°, pulse 78. Retention of urine and fæces.

Jan. 7th.—Temp. 38°, pulse 78. The patient makes the same reply to all questions. The paresis of the extremities is not marked. The facial paralysis as before. Marked œdema and injection of left eye and temple. When syringed, necrotic masses were removed from the abscess cavity. Evening temp. 38.2°, pulse 72.

Jan. 8th.—Temp. 38.6°, pulse 76. Somnolence, paresis of extremities more marked; no other change.

Jan. 9th.—Temp. 39.6°, pulse 72. The right extremities are almost entirely paralyzed and have lost their sensibility.

Jan. 10th.—Temp. 39.2°, pulse 76. The right pupil is contracted, both react sluggishly. Fundus normal. The patient speaks only a few words, and groans at times. Involuntary passage of urine, vomiting. A quantity of necrotic masses removed from the abscess cavity. Evening temp. 39.4°, pulse 90.

Jan. 11th.—Temp. 40°, pulse 94 and weak. Both pupils much contracted and irresponsive. Conjugate deviation to right. Nystagmus. Complete paralysis of right limbs and of both facial nerves, tetanic spasms in all the limbs. Patient died at 8 P.M.

Diagnosis: Left suppurative otitis media chronica, caries of tegmen tympani, abscess in left temporal lobe.

After Operation : Diffuse meningitis, thrombosis of transverse sinus.

Autopsy, three days after death : Prolapsed brain substance filled the osseous wound, dura hyperæmic, left hemisphere mottled with extravasations of blood. The sulci contain purulent fluid. The pia is opaque. The left hemisphere was almost totally destroyed. With the exception of the anterior portion of the frontal lobe and the posterior portion of the occipital lobe, the entire hemisphere consists of a reddish pulpy mass enclosed in a thick capsule. This mass is similar to the necrotic bits removed by syringing. The base of the right hemisphere, the pons, and the cerebellum are covered with thick yellow pus. The third ventricle also contains pus. The left transverse sinus contains a yellow thrombus. When opened a quantity of dark blood escaped. The dura covering the tegmen has a small perforation. The bone here is eroded and shows a carious opening which leads into the tympanic cavity. There is no pus between the dura and the bone. The malleus and incus are wanting. *The mastoid process is healthy.*

In this case it was possible to diagnose the abscess early, to locate and to open it. The slowing of the pulse and the general weakness and apathy depending on increased intracranial pressure indicated an abscess. The diagnosis was supported by the paresis of the extremities of the opposite side, the coma, the manner of development of the paralyses, and their increase with the increase in the other symptoms. The general weakness, etc., were points duly considered. The abscess was located in the left temporal lobe for the reason that the tegmen tympani was diseased, and further for the reason that the symptoms pointed to this location in contradistinction to other regions of the cerebrum or cerebellum.

The symptoms spoken of by all authors, viz., *fever*, and *headache*, spontaneous or on percussion, *were wanting*. Fever may have existed at an earlier period, but during the patient's stay in the hospital it was absent. Headache was absent in the entire course of the disease. It is impossible to say why such a general meningitis and cerebral necrosis developed three days after the operation. Possibly the probing and

examination with the finger may have caused it, perhaps also the pressure of the drainage tube on the opposite cerebral surface, or it may have been simply the result of cutting into the softened cerebral substance. We cannot, however, deny the influence of the operation and the subsequent manipulation on the development of secondary inflammatory processes in the brain and its membranes, for we know that often the slightest injury of the cerebral substance leads to the most severe and fatal cerebral inflammation. The great destruction of the left hemisphere which was found at the autopsy must have been caused after the operation, as such a condition was not found after opening the abscess and the clinical symptoms were against it. The severe local and general symptoms which threatened the life of the patient made it necessary to open the abscess before the removal of the diseased parts in the middle ear and in the temporal bone. The prolapse of cerebral substance must be regarded as the result of increased intracranial pressure.

Although this case resulted unfavorably, it is instructive, as it shows that fever and headache are not constant symptoms of otitic brain abscess and that therefore their absence does not preclude the possibility of an abscess existing when other characteristic symptoms point to it.

REMARKS ON THE PRECEDING CASES.

In the five cases the diagnosis was made three times at an early stage and twice after the rupture. The localization was wrong in Case 3, the autopsy showing an abscess of the cerebellum and not of the cerebrum. The histories show that each case had some peculiarities which were wanting in part or altogether in the others. This variability of the symptoms has been mentioned by other writers. If we consider Cases 2 and 5, which were under extended observation and in which a low degree of fever developed only on the day before death (2), or was altogether wanting (5); and on the other hand consider Cases 4 and 5, in which headache was wanting in the entire course of the disease, we must conclude that otitic brain abscess may run its course without fever and without headache. As this was found twice in five

cases, the absence of these two important symptoms cannot be unusual. Vomiting, debility, lassitude, and a normal fundus were always present. There was loss of appetite in 4 cases; constipation in 3; tremulous tongue in 3; emaciation in 2; focal symptoms in the last stages in all cases; ptosis in 1; blepharospasm in 2; contraction of the pupils in 3; greater contraction of pupil on diseased side in 2; paresis or paralysis of the facial nerve on the side opposite the abscess in 3; contractures, convulsions, hemiplegia, local anæsthesias, increased and later diminished cutaneous and tendon reflexes, were more or less marked in all cases. The intellect was clouded twice in the late stages, and at intervals in one case. The abscess was on the right side in 3 cases, twice in the cerebral hemisphere, once in the cerebellum. In 4 cases there was a single abscess, in 1 case, two. Uncomplicated abscess in 3 cases; complicated with thrombophlebitis in 3. Extradural collections of pus were found in 2 cases. Death was due to rupture of the abscess into the cranial cavity in 2 cases; into a lateral ventricle in 1; it was due to cerebral œdema and interference with vital functions in 1; and to encephalo-meningitis after operation in 1. All the abscesses were encapsulated and their contents were offensive.

This grouping of the symptoms in these five cases shows that there are but few symptoms common to all, and shows further that none of these symptoms, regarded individually, is pathognomonic of otitic brain abscess. The ætiology, the careful weighing of the symptoms, the duration and the length of time that the patient has been under observation, are all points that must be taken into consideration in making an early diagnosis. In some cases one to two days will be sufficient time in which to make a diagnosis, in others several days or some weeks will be necessary. It is of course possible that some patients may be lost by waiting, but I believe that no one should open the cranium and puncture the brain without a reasonably certain diagnosis having been made, for in spite of our antiseptic treatment we are not yet able in all cases to prevent infection of the wound or a fatal encephalo-meningitis.

GENERAL REMARKS.

The otitic abscesses make up from one half to three fourths of all the cases of brain abscess. Gowers,¹ in 173 cases, found 102 of otitic origin, 57 traumatic, 6 from nasal disease, 3 from orbital disease, and 5 from caries of other cranial bones.

Otitic abscesses may occur in any part of the brain, but are more frequently found in the hemispheres, and in the lobes of the cerebellum, more frequently in the white than in the gray matter. Abscesses are rarely found in the central ganglia or in the medulla. Barr² in 76 cases found the abscess in the middle lobes of the cerebrum 55 times

" " cerebelum	13	"
" both cerebrum and cerebellum	4	"
" the pons	2	"
" crura	2	"

Körner³ in 100 cases found the abscess

in the cerebrum	62 times
" " cerebellum	32 "
" " cerebrum and cerebellum	6 "

These abscesses are found more frequently on the right than on the left side (Körner,⁴ Meyer,⁵ Huguenin,⁶ Robin,⁷ Schwartz⁸). According to Körner,⁹ who is supported by the anatomical studies of Bezold and Rüdinger,¹⁰ the tegmen tympani is thinner on the right than on the left side in 77 per cent. of cases, and therefore morbid processes on the right side extend more readily into the cranial cavity than those on the left, and the dura with its blood and lymph vessels is more readily affected even when the bone is healthy.

In 100 cases, Körner found 62 in the cerebrum, 32 in the cerebellum, and 6 in both,

¹ *Diseases of the Nervous System*, vol. ii.

² *Brit. Med. Jour.*, 1887, vol. i., p. 723.

³ *Arch. f. Ohrenheilk.*, vol. xxix.

⁴ *Arch. f. Ohrenheilk.*, vol. xxvii.

⁵ *Arch. f. Ohrenh.*, vol. xxvii.

⁶ *Pathology of Cerebral Abscess*. Zurich, 1867.

⁷ *Ziemssen's Handbook*, vol. xi., p. 661.

⁸ *Des Affections Cérébrales Conséc.*, etc., 1883.

⁹ *Surgical Diseases of the Ear*, 1885, p. 403.

¹⁰ *Monatssch. f. Ohrenheilk.*, vol. vii, No. 11.

in cerebrum	in cerebellum	in both
right 34 = 55.5 %	21 = 65.6 %	4 = 66.6 %
left 26 = 41.3 %	10 = 31.3 %	2 = 3.33 %
In both hemispheres of cerebrum 2 = 3.2 %, of cerebellum 1 = 3.1 %.		

These statistics, like those of other authors, show that otitic brain abscesses are found twice as frequently in the cerebrum as in the cerebellum. Cerebral abscesses are most frequently found in the temporal lobes, less frequently in the frontal, rarely in the occipital, and in very exceptional cases in the parietal lobes. The comparative statistics as to the relative frequency of abscesses in the temporal lobes show a marked difference in Barr's and in Körner's tables. The former found 72.3 %, the latter 37.3 %.

Otitic abscesses occur in males twice as often as in females. Körner in 62 abscesses of the cerebrum, 43 in males and 19 in females; in 32 abscesses of the cerebellum, 20 in males and 12 in females.

Abscesses are observed at every age, rarely, however, under ten years, and mostly between the ages of twenty and thirty. Hartmann explains their rarity in infancy by the fact that the posterior fossa is farther distant from the tympanic cavity in infants than it is in adults, and therefore a disease originating in the mastoid or in the tympanic cavity does not extend so readily to the posterior fossa.

The most frequent cause of otitic brain abscess is chronic purulent otitis media, and particularly caries of the mastoid consecutive to this. A brain abscess may develop, however, without preceding caries of the bone.

Such cases, and in general those in which the dura is not affected, are very rare. The bone and dura are found diseased in 64.8 per cent. of cerebral abscesses, in 73.3 per cent. of cerebellar abscesses, and in 83.3 per cent. of the cases in which there are abscesses both in the cerebrum and in the cerebellum. The exciting causes of otitic brain abscess, when the affections mentioned above exist, are exposure to cold, injuries, and retention of pus in the middle ear from any cause whatever. In rare cases brain abscess

follows mastoid operations (v. Bergmann). Brain abscesses usually develop after the aural disease has lasted a long time. There are cases, however, in which only some weeks or months elapse between the appearance of the aural disease and the development of the abscess.

The abscess is usually found on the side of the diseased ear. In many cases it is separated from the temporal bone by a more or less thick layer of healthy brain substance. In a greater number of cases there is a direct communication between the pus in the bone and that in the abscess. Healthy brain substance between bone and abscess was found by Körner 10 times in 90 cases; by Robin 14 times in 67 cases. Körner found a communication between the abscess and the bone 20 times; in 7 the abscess was separated from the bone by the dura alone; in 12 the brain substance was adherent to the meninges over the diseased bone; in 8 the brain substance between the bone and the abscess was softened. In rarer cases the abscess is found on the opposite side (v. Troeltsch, Magnus, Robin). I believe that the diminishing frequency of these cases and a study of the earlier histories make it seem doubtful whether they are really cases of otitic brain abscess.

The true otitic abscess is usually single, but may be multiple. Körner in 100 cases found an abscess in the cerebrum and a second in the cerebellum 6 times. In 62 cases of abscess of the temporal lobe this was double 6 times, and in 32 cases of cerebellar abscess it was multiple in 4 cases.

The formation of an abscess at some distance from the purulent disease is caused by the transference of septic material containing pathogenic microbes. Sluggishness of the circulation in the sinus allows this septic material to reach the brain through the veins which run from the ear to the brain and carry their blood into the sinus (Adams). The perivascular lymph sheaths may also carry the infection (Gowers). Biswanger believes that the principal channels of transmission are the perivascular sheaths of the branches of the carotid which spread out in the tympanic cavity. A serious objection to this hypothesis is the fact that abscess of the frontal lobes is exceedingly rare.

Toynbee was the first to observe that diseases of the tympanum cause cerebral abscesses for the most part, and diseases of the mastoid chiefly cerebellar abscesses. This is explained by the fact that the tegmen tympani forms a portion of the middle cerebral fossa in which the temporal lobe rests, and the bone which separates the mastoid cells from the cranial cavity forms a portion of the posterior fossa in which the lobes of the cerebellum lie.

Suppuration in the brain is the result of an inflammation, and the first stage of the abscess is probably the "red softening." The pus has a greenish color, is thinly fluid, mixed for the most part with fibrinous masses, and its reaction is usually acid. After the abscess has lasted for a time the capsule forms about it, at first very thin but gradually becoming thicker and denser. Its inner surface is smooth and consists of connective-tissue elements. The neighboring brain substance is often softened by a slight œdema, and immediately about the capsule it may undergo fatty degeneration. The capsule offers no obstacle to the enlargement of the abscess, and if there is a canal, permitting some escape of pus, there may be an excessive secretion. In half the cases there is no capsule. In cerebral abscesses Körner found a capsule 16 times, and 17 times none. In cerebellar abscesses it was found 12 times and was wanting 8. The capsule generally appears about the second month, but may appear later. The abscess may be entirely encapsulated, or it may have a fistula opening into a ventricle or externally. The fresh abscess is usually irregular in form, the encapsulated abscess round or oval.

An encapsulated abscess may remain stationary, and its capsule become thicker, and capsule or contents become calcified.¹ More frequently the abscess enlarges and causes death by interfering with vital functions or by rupturing and causing inflammation.

Brain abscess not of otitic origin, may empty into the tympanic cavity and thus cause a secondary otorrhœa (Itard, Rokitansky, MacLeod, Berndgen, Odenius, and others).

¹ Fenman, *Edinburgh Med. Jour.*, Oct., 1879.

Such cases, however, are rare. Brain abscesses are rare after acute inflammations of the middle ear (Lebert, Farwick, Horsley-Ferrier, Schmidt, Baginsky, Gluck), and mostly develop in the course of chronic otorrhœa.

In every brain abscess three stages must be distinguished :

1. The *inflammatory*, lasting a varying period from some days to two weeks, characterized by the general symptoms of an acute encephalitis, or, as is more common, it begins with vague symptoms not distinguishable from those of the purulent otitis. For this reason it is difficult to fix exactly the beginning of the abscess.
2. The *latent* stage which lasts from a few weeks to a year or two, and in exceptional cases as long as twenty-five years. It is rare, however, that there are not some symptoms present which would point to cerebral disease. Usually there are headache, mental depression, convulsions, etc.
3. The *terminal* period, corresponding to the enlargement of the abscess. This may last from a few days to a couple of months. In rare cases death is due to an accidental disease of some other organ.

In describing the symptoms of otitic brain abscess I shall follow Bergmann's classification. He divides the symptoms into 3 groups. 1. symptoms depending upon the suppuration; 2. symptoms depending upon increased intracranial pressure; and 3, focal symptoms varying with the location of the abscess.

The symptoms of the first group are not characteristic, being found with any suppuration. The first of these is fever. It is often intermittent, and may be wanting altogether. It appears chiefly in the terminal stage, coming on with a chill and ending with a profuse perspiration. This may be mistaken for malaria. The temperature is usually not high. The fever may last one day or several days.

Besides fever there is debility and general depression. The patient suffers from pain in the stomach, loss of appetite, swelling of the abdomen, constipation, nausea and vomiting. *The last is said to be found particularly with cerebellar abscesses*; this I cannot confirm as I found it in all my cases. The tongue is dry and brown, or bluish, and is tremulous. The patient becomes rapidly emaciated in

consequence of the suppuration and the diminished nutrition. All these symptoms, however, are frequently found with suppurative processes in the middle ear and in the mastoid, particularly when there is retention of pus.

The first group of symptoms is almost without exception accompanied by symptoms of the second group. The principal symptom of this category is headache. This occurs with abscesses as well as with tumors, and has the same character in each. At times the headache is slight, the patient complaining of heaviness and dulness; at other times it is very severe. Muscular exertion, pressure on the head, the use of alcohol, a low position of the head, anything in fact that increases the cerebral blood pressure, aggravates the headache. The headache is usually fixed, and corresponds to the location of the abscess; but this is not always the case and the seat of pain may shift daily, or the pain may be generally distributed over the entire head. There are also cases which run their course without headache. The headache usually is more severe during the febrile attacks. Percussion over the abscess increases the pain. This experiment is only of value when it is not performed in the neighborhood of the mastoid, for in the latter case the pain may come from a collection of pus between bone and dura, or in the mastoid or middle ear rather than from an abscess in the brain (Bergmann). Schwartze believes that in cerebellar abscess there is constant pain in the occipital region. Körner, however, found occipital pain only 8 times in 21 cerebellar abscesses; 3 times there was frontal pain with cerebellar abscess, and 5 times there was occipital pain with abscess of the temporal lobe.

Vertigo is a frequent symptom, occurring usually with changes of posture. The vertigo increases usually in intensity when the headache is more severe. It is found equally in cerebral and in cerebellar abscess. The patients often appear intoxicated. The vertigo is accompanied by tinnitus. In some cases it is so severe that patients become almost unconscious. Others wander about aimlessly, do not reply to questions, etc. The giddiness may also be the result of a simultaneous labyrinthine affection.

The pulse is reduced in frequency to 50, 40, or even 30, toward the end of the disease, or perhaps in its entire course. Often the slowing of the pulse becomes more marked as the abscess increases in size. Slowing of the pulse, when there is fever, severe headache, and somnolence is very indicative of brain abscess. Optic neuritis is not frequent in otitic brain abscess.

The third group are the *focal* symptoms. Unfortunately they are not so frequent nor do they appear so early as might be desired. They only appear when the abscess is in the neighborhood of the motor region or in the gray substance. They are almost entirely wanting when the abscess is localized in the white substance of the frontal, temporal, or occipital lobes. The focal symptoms depend upon the degree of destruction or softening of the brain substance. A collection of pus in the white substance interferes with conduction without abolishing it.

Convulsions are a frequent focal symptom of otitic brain abscess. They have the character of epileptic or apoplectic attacks. They appear at the beginning and at the end of the terminal stage. They are mostly accompanied by paralyses of the same side. If the abscess ruptures and causes purulent meningitis in the region of the pons or the medulla, there will be rigidity of the occipital region and slight opisthotonus.

Paralyses, chiefly hemiplegic, are found in about half the cases. Usually they are not complete. Frequently they follow unilateral convulsions. If the abscess has invaded the gray substance or impinged upon the motor tracts, the paralyses are marked and are limited usually to one arm with or without implication of the face. With hemiplegia, the sensibility is diminished, otherwise it is normal or increased. The sensibility is markedly diminished in abscess of the optic thalamus, of the posterior portion of the hemispheres, or of the cerebellum with pressure on the pons. The cranial nerves are often involved. Paralysis of the facial and auditory nerves is due to disease of the temporal bone; it is always found on the side of the affected ear, and is usually not complete. In the terminal stage

paralyses of the opposite side may develop. The speech is often slow, but articulation and deglutition are only markedly affected when the abscess is in the neighborhood of the pons.

Photophobia is not rare; it increases usually with the increase in the headache. The pupils are usually irregular and unequal in size. In the last stage the pupillary reaction is sluggish or entirely absent. Ptosis is often found on the side corresponding to the abscess; at times also paralysis of ocular muscles. In cerebellar abscesses when there is pressure on the pons, the motion of the eyes may be restricted in a particular direction. Hemianopia and nystagmus are often observed.

Psychical disturbances are frequent. Mental disturbances are of varying degree, from a slight weakness of the intellect to marked symptoms of mania and delirium. The character of the patient changes without any appreciable cause; he becomes depressed and reserved, the memory is weak, and the patient loses his ability to work. Later there is hypochondria, and sometimes there is a tendency to suicide. All these symptoms may be of long duration and give the picture of a mental affection, and such patients have often been confined in insane asylums. In the terminal stage often a soporose or comatose condition develops. These symptoms cause death directly or they appear by paroxysms and eventually lead to a fatal termination.

All these symptoms present two chief characteristics viz.: they rarely occur isolated, and they usually show paroxysms of varying duration. The remissions are often very long and years may elapse between the initial and the terminal stage. Each attack is more severe than the preceding one. The paroxysmal attacks depend on the sudden increase in the intra-cranial pressure or on circulatory disturbances in the neighborhood of the abscess. When nervous symptoms appear, the course of the disease is, as a rule, more rapid. Gowers (*l.c.*) states that, in the cases which he has collected, the terminal period in one fourth of the cases was less than five days, in one third of the cases less than ten days, and in seven eighths not longer than a month.

Whatever may be the nature of the symptoms, whether constant or paroxysmal, the disease ends always with the rupture of the abscess into a lateral ventricle or more rarely on the surface. The escaped pus kills the patient suddenly, simulating thus an apoplexy, or a severe meningitis develops, which causes death in a short time. There are also cases in which the patient dies suddenly without rupture of the abscess. In such cases death is due to the sudden compression of vital centres in the brain.

The *lack of constancy* in the local symptoms, their *similarity to the symptoms of other less dangerous diseases*, such, for example, as simple purulent inflammation of the middle ear, and the long *periods of intermission*, make the diagnosis difficult or impossible. It may be said that there is scarcely a brain disease of like severity that is so often overlooked. The diagnosis is often rendered more difficult by the intracranial complications which are present at the same time and have their own complex of symptoms. Robin who collected 200 cases of caries of the temporal bone and of other aural diseases, found 70 pure cases where only one brain affection was present; 55 with cerebral abscess and meningitis; 20 with cerebral abscess, phlebitis, and meningitis; 3 with cerebral abscess and phlebitis; 1 with abscess of cerebrum and cerebellum, phlebitis and meningitis; 22 with cerebral abscess; 4 with cerebellar abscess. In the remaining cases there was no brain abscess. From this we see that for 26 cases of pure otitic brain abscess there were 79 cases in which there were intracranial complications. Körner found the brain abscess most frequently complicated with phlebothrombosis of the transverse sinus. *In three fourths of the cases of otitic brain abscess the course is such that a diagnosis can be made.* The careful weighing of all the symptoms, the localization of the bony affection, the ætiological elements, and the length of time the patient has been under observation, if carefully considered, enable us not only to diagnose the abscess but often to localize it.

Otitic brain abscess may be confounded with collections of pus between dura and bone, meningitis, acute purulent otitis media, thrombo-phlebitis, general infection, apoplexy, brain

tumors, functional disturbances of the brain, and with intermittent fever.

The collections of pus between the dura and bone, the so-called pachymeningitis externa suppurativa circumscripta, arise in the same manner as brain abscess, principally from the retention of pus in the middle ear. The pachymeningitis suppurativa is distinguished from the brain abscess by the fact that with the former there are no symptoms of increased intracranial pressure. In pachymeningitis, moreover, there are local changes in the bone, such as fistulæ which lead directly into the cranial cavity. If both diseases are present together, the diagnosis is often impossible.

A meningitis may be confounded with an abscess, as the former often occurs in the terminal stages of abscess, and as both diseases may arise from the same cause. In abscess the prodromal symptoms are usually of longer duration; meningitis affects the cranial nerves more extensively. An abscess in the pons may affect a number of nerves, but it is of extreme rarity. The meningitis of the terminal stage of abscess is purulent, and has a much more rapid course than primary meningitis. The diagnosis of the latter is frequently supported by the previous brain symptoms which differ in the two diseases. Much depends on the time when the patient is first seen, and the length of time that he remains under observation. If we see the patient for the first time when the symptoms of abscess are partly masked by those of meningitis, a longer period of observation is required in order to make a correct diagnosis. Many patients, however, die before the diagnosis is made. If an abscess ruptures into a lateral ventricle or on the surface, and an aural supuration has previously existed, the sudden and severe symptoms can be understood.

The differentiation of an otitic brain abscess from an otitis media suppurativa is often difficult, as many general brain symptoms may be produced by an otitis. In suppurative otitis, among other symptoms, optic neuritis and paralysis of the extremities may be observed. I believe that the difficulty in diagnosis is not because an aural supuration runs a course simulating that of brain abscess, but

that brain abscess in some stages may not reveal itself, and may show only such symptoms as may be attributed to the existing aural inflammation.

Thrombo-phlebitis of the sinuses, from which usually a general infection arises, as well as general infections of other sorts, as typhus, etc., may sometimes be mistaken for brain abscess. This is hardly possible in uncomplicated abscess. The pulse, the character and the localization of the headache, the fever, the paroxysmal character of the symptoms of abscess, the general condition, and the focal symptoms prevent error.

The distinction between an apoplectic attack and the rapid terminal stage of abscess is not difficult when there has been or is suppuration of the ear.

Brain abscess may be distinguished from brain tumor by attention to the following points: In abscess a causative element may always be found. The absence of such speaks in favor of tumor. Marked focal symptoms, slow course, particularly when there is progressive paralysis of the cranial nerves, and an intense optic neuritis, favor the diagnosis of neoplasm. The rapid development of severe brain symptoms coming on after symptoms of a mild brain affection favors the diagnosis of abscess, particularly when there are chills and fever. Both abscess and neoplasm, however, may develop simultaneously.

Functional brain disturbances can only be confounded with abscess when the latent stage shows only convulsions and psychical disturbances. If there is another characteristic symptom, such as optic neuritis, slowing of the pulse, or headache, the error is easily avoided.

The intermittent character of the fever in brain abscess, which often begins with a chill and ends with a perspiration, may cause a wrong diagnosis in a very early stage of abscess. The appearance of other characteristic symptoms clears up the diagnosis.

The localization of a brain abscess is often exceedingly difficult. In the first place we must distinguish between cerebral and cerebellar abscess. For cerebellar abscess the characteristic symptoms are disturbances of co-ordination,

such as uncertain gait and excessive vertigo, but these symptoms are rarely found, and they occur also in other diseases of the central nervous system. The location of the headache is of some importance. The portion of the bone which is diseased may be of some assistance. But if both the mastoid and the tegmen are involved, or if both tympanic cavities are affected, as is often the case, we get little information as to the location of the abscess. The various disturbances in the motor and sensory cerebral and spinal nerves have no diagnostic value. A complete paralysis of one facial nerve, however, may point to an abscess in the same side of the cerebrum. McBride and Miller¹ found a labyrinthine affection in 4 cases of cerebellar abscess, and no labyrinthine affection in 15 cases of cerebral abscess, from which they concluded that in doubtful cases the absence of bone-conduction would indicate cerebellar abscess. This symptom is not constant, however. Körner in his cases found bone-conduction wanting nine times in cerebral abscess, and present in nine cerebellar abscesses. Disturbances of speech occur only in cerebral abscess, but they are rare.

From what has been said it will be seen how difficult it may be to differentiate between cerebral and cerebellar abscess. The exact localization of a cerebral abscess is a still more difficult matter. The centrum ovale, according to previous experience, gives no focal symptoms,² so that large abscesses may develop in any of the cerebral lobes without causing any symptoms. Only when the abscess reaches the internal capsule or the gray substance, and these parts are compressed or irritated, do focal symptoms appear. Experience shows that the greater number of otitic brain abscesses are localized in the temporal lobes, and this point should be considered in making a differential diagnosis. A considerable portion of the frontal lobe may be destroyed without exciting the least suspicion that so serious a con-

¹ *Edinburgh Med. Journ.*, 1887, May and June.

² Disturbances of speech have been described with foci in the medullary layer by Kussmaul, Pitres, and Wernicke, but it seems that in these cases the gray substance was also involved (Nothnagel, *Topische Diagnostik der Gehirn Krankheiten*, p. 357).

dition exists. The nearer the abscess approaches the posterior segment of the frontal convolutions, the more frequently we find conjugate deviation of the eyes, disturbances of speech, and from irritation of the left third frontal convolution, ataxic aphasia. With abscess in the occipital lobe hemianopia is often found.

Multiple abscess cannot be diagnosticated. Usually only one is recognized.

The prognosis of otitic brain abscess until recently was bad, every case terminating fatally. There were a few cases reported in which the abscess became calcareous or cicatricial and the disease did not advance for years, but these cases are very exceptional. Only since cases have been operated, has the prognosis improved. It is to be hoped that when the diagnosis becomes more certain, and the method of operating improved, the prognosis will be much better.

In the present state of our knowledge there is but one indication to be fulfilled, viz., to permit the escape of pus from the brain. The operation should be undertaken only when the diagnosis is sure or nearly so, and never in my opinion in doubtful cases. Bergmann rightly says: "We are not to blame for being unable to recognize every abscess in the cerebrum or cerebellum, but we are to blame in leaving unopened an abscess which has been clinically diagnosticated with certainty."

As early as 1854 Victor v. Bruns gave classic indications for opening the cranial cavity, which even to-day, after the introduction of antisepsis, are rational, and the only correct indications for the operation of otitic brain abscesses. According to Bruns the operation shall not be done, (1) unless there are symptoms present which make us reasonably sure of the existence of an abscess and fairly certain as to its location; (2) when we are quite sure of the existence of an abscess and of its location, the operation should always be done; (3) when the diagnosis is uncertain there is slight chance of a favorable result. In the latter cases the opening of the skull must not always be refused, nor always performed. If the diagnosis is once sure, the operation should be done

at once, for the abscess may burst unexpectedly or cause sudden compression of vital parts, so that a few hours' delay may lose the patient's life. Bergmann has reported such cases, and I have twice seen them.

The number of cases of operation for otitic brain abscess which have been reported, including my own, is 32; in 17 the result was good, in 15 fatal. The cases of the first category are as follows: 1 by Moraud (1751) and 1 by Le Roux (1844).¹ Of later years the first successful operation was by Schede-Truckenbrod (1885)²; 2 by Barker (1886 and 1888);³ 1 by Bergmann (1888)⁴; 2 by MacEwen (1887 and 1888)⁵; 1 by Horsley-Ferrier (1888)⁶; 1 by Greenfield (1887)⁷; 1 by Schwartze (1886)⁸; 2 by Pritchard (1890)⁹; 1 by Gluck-Baginsky (1891)¹⁰; 1 by Sick (1890)¹¹; 1 by Hoffmann (1890)¹²; 1 by Truckenbrod (1891).¹³

The cases ending fatally are as follows: 2 operated by Bergmann, 1 by MacEwen, 1 by Hutton-Wright, 1 by Weir, 2 by Schwartze, 1 by Piqué, 2 by Gluck, 1 by Jansen, 1 by Arbuthnot Lane, 2 by Truckenbrod, and 1 by myself.¹⁴ The number of fatal cases is probably greater, but these are all that have been reported.

Chauvel and Bergmann have indicated the point where the skull should be opened. Chauvel believes that the temporal lobe is best reached through an opening just above the external auditory canal. This corresponds to the centre of the region indicated by Bergmann. The region within

¹ *Arch. f. Ohrenh.*, vol. xxix., p. 161.

² ARCH. OF OTOL., 1886.

³ *Brit. Med. Jour.*, Dec. 11, 1886, and vol. i., p. 777, 1888.

⁴ *The Surgical Treatment of Brain Diseases*, 1889, p. 59.

⁵ *The Lancet*, vol. i., p. 616, 1887; and *Brit. Med. Jour.*, vol. ii., p. 310, 1888.

⁶ *Brit. Med. Jour.*, vol. i., pp. 530 and 636, 1888.

⁷ *Ibid.*, No. 1363, p. 317, 1887.

⁸ *Arch. f. Ohrenheilk.*, vol. xxix., p. 163.

⁹ ARCH. OF OTOL., Nos. 2 and 3, 1890.

¹⁰ *Berlin. klin. Wochenschr.*, No. 48; 1891.

¹¹ *Deutsche med. Wochenschr.*, 1890, p. 186.

¹² *Ibid.*, 1890, p. 1082.

¹³ ARCH. OF OTOL., ii., 1892.

¹⁴ These cases are mostly published with the favorable ones. Piqué's case is in the *Annales des Mal. de l'Oreille*, etc., 1890, vii., p. 437; Jansen's in *Berliner klin. Wochenschr.*, No. xlix., 1891.

which Bergmann operates is bounded about by the upper margin of the temporal suture. This corresponds in location to the fissure of Sylvius, above which one should not go. The upper limit is given by a line parallel to the zygoma and about 5 *cm* above it. The lower boundary of the trephine opening must be at least 1 *cm* from the root of the zygoma above the external auditory canal. The posterior boundary is a perpendicular to the line joining the lower orbital margin and the occipital protuberance, erected at the posterior margin of the mastoid. The anterior boundary is formed by a second perpendicular through the articulation of the lower jaw. This region includes the extreme limits within which the skull should be trephined. In operating for cerebellar abscess, Bergmann advises placing the centre of the opening on the posterior boundary, making a large cutaneous and periosteal flap with its convexity extending downward to the outer surface of the mastoid. In this way we expose the postero-inferior angle of the parietal bone and its articulation with the temporal and occipital bones, and also the large emissary vein, all of which are of localizing value. The English surgeons confine themselves for the most part within the limits given by Bergmann; some, however, make a second opening farther back in order to give the pus a better exit. The study of a number of skulls has convinced me that, in abscess of the temporal lobe, it is better to make the trephine opening farther forward, at Bergmann's anterior limit, in order to avoid a possible wounding of the transverse sinus, which is not of great importance, but is sometimes an unpleasant complication. In many cases, however, the opening of the sinus is indicated, as the exposure and antiseptic treatment of the dura may favorably influence an existing inflammation, and prevent its spreading farther (Hoffmann). According to Schwartze, in cerebellar abscess the mastoid antrum should first be opened if this has not been already done, and then a second opening made farther backward and higher up. The direct opening of a brain abscess through the roof of the mastoid, as first done by Truckenbrod, has the advantage that it allows free escape of the pus and does not

injure the cranial wall. Further experience is necessary before the value of this method can be definitely ascertained.

The trephine opening should be at least 3 *cm* square. A very large opening in the bone and in the dura may be dangerous, as a fatal œdema may follow a venous hyperæmia. German surgeons use the chisel and hammer; English, the trephine. I believe that the trephine causes less shock than the hammer.

After making the wound in the bone, the condition of the dura is of importance and should be noted. If it is tense, as is often seen when there is an abscess, no pulsation will be felt. There are, however, many exceptions to this rule, and therefore the existence of pulsation should not cause the surgeon to hesitate about continuing the operation.

A long cut is made in the dura, and the knife is then passed directly into the brain. Often an aspiration needle is first passed in and if pus is found the wound is enlarged. It has happened a number of times that the aspiration needle, after being thrust in several times, has failed to find pus in cases where an abscess was found at the autopsy (Bergmann, Schönborn, Kappeler). Aspiration is not altogether innocent procedure. Beck saw hemorrhage into the lateral and the fourth ventricle follow it.

The brain wound is enlarged by forceps and after the escape of the pus a sufficiently large hard drainage-tube is inserted, which should not press on the abscess wall. The wound is then washed out and the cavity filled loosely with iodoform gauze. The experiments of Fauvel, Wagner, and Bergmann, in leaving the button of bone beneath the skin flap, have not been always successful, since the bone becomes necrotic.¹ The wound usually heals in from two and a half to six weeks.

If after opening the abscess a thick and irregular capsule is found which might cause the stagnation of the pus, Bergmann advises its removal.

If the abscess is not entirely emptied, or if a second one is present, the increased intracranial pressure may force the

¹ Truckenbrod, *Arch. of Ophth.*, 1892.

brain through the trephine wound, and the meningo-encephalitis which usually soon comes on in such cases may cause necrosis. In cases of brain prolapse the retained pus should be removed and active antiphlogistic treatment instituted.

Hemorrhage in the course of the operation, coming from the brain substance, pia mater, sinus, or bone, is usually not alarming and is readily checked with tampons of iodoform gauze. When the middle meningeal artery has been cut, compression is often all that is needed, but if this is not successful, the bone must be farther removed and the artery tied, a task not always easy to perform.

When the wound is infected in the course of the operation or afterwards, death quickly follows from meningitis, encephalitis, or thrombosis and pyæmia.

After the healing of an otitic brain abscess, we may have headache (Barker), aphasic disturbances (Schede), or later epilepsy. These symptoms result from the destruction of a portion of the brain by the abscess, or from the changes about the cicatrix formed.

As the greater number of otitic brain abscesses are the result of an affection of the bone, the mastoid should be opened, or carious and necrotic bone in the tegmen tympani should be removed according to Küster's¹ or Stucke's² method, before the abscess is attacked directly, except in exceptional cases, when a sudden lethal ending may be feared.

An important point is the prophylaxis of otitic brain abscesses. An early and a rational treatment of the primary aural affection will often prevent the formation of an abscess.

Internal medication is useless in cases of otitic brain abscess. When the diagnosis is once positive, there is nothing to be done except to remove the pus.

¹ *Deutsche med. Wochens.*, Nos. 12 and 13, 1889.

² *Arch. f. Ohrenh.*, vol. xxxii.

HISTOLOGY OF TWO PETROUS BONES OF A GIRL COMPLETELY DEAF FROM SCARLET FEVER: DIED OF PURULENT MENINGITIS.

By S. MOOS, HEIDELBERG.

Translated by Dr. C. ZIMMERMANN, Milwaukee, Wis.

(With Plates I. and II. of vol. xxiii, German Edition.)

IN order to complete my former communications on the changes in the petrous bone following recent cases of diphtheria, I shall describe two specimens, in which the aural disease had run its course for a long time. They were taken from a girl of twelve years, who died of purulent meningitis, having lost her hearing completely after scarlet fever and diphtheria three years previously. Drs. Doering and Wein-kauff kindly furnished the clinical notes.

In May, 1886, the child, perfectly healthy before, fell sick with scarlet fever and diphtheria of the naso-pharynx. On the fourth day acute purulent otitis media of both ears set in. She could hear only very loud noises, and even these faintly; suffered from vertigo and staggering gait. The child complained of constant earache for a long time afterwards and frequently of headache, especially during the night. In January, 1889, she had measles, after which the discharge from both ears became more copious. January 15, 1889, the child was taken into the eye-clinic at Heidelberg on account of membranous conjunctivitis of left eye. Temp. 39.8° . Besides she had diffuse bronchitis, painful and swollen submaxillary glands, headache, and pain in the abdomen. The purulent offensive secretion ceased in the right ear after a few days, in the left on January 21st, simultaneously with the fall of temperature to 38° , which had been continuously from 39° to

40°, and then wavering between 38° and 39° until January 27th, when it rose to 40.4°. At the same time the left ear discharged pus again until death, the right only for one day. The temperature, being about 39°, rose shortly before death to 40°. There was complete deafness for voice, and somnolence, from the first days. At first there was constipation; after a while she had screaming spells during sleep, continually grasping her head, vomiting, and grinding her teeth; left-sided hemiplegia, convulsions of the facial muscles, clonus of the muscles of the neck, retention of urine, spontaneous defæcation, abolition of the tendon and skin reflexes after preceding general hyperæsthesia, very marked clonus of left foot, increasing somnolence; death, January 29th, without special premonitory symptoms. The nose discharged brownish pus since January 28th. Abdomen soft but retracted. The ears were syringed three times a day with a solution of boric acid. The pulse, at first 100-120, irregular, was 80-100 simultaneously with the low temperature; in the last days of her life 140-160; respiration, which had been accelerated, was 12. Cheyne-Stokes phenomenon only transitory.

Clinical Diagnosis: Meningitis, conjunctivitis membranacea; bronchitis diffusa; otitis media purulenta duplex.

Post-Mortem Examination by Dr. Ernst, Jan. 30, 1889: Purulent meningitis (of convexity and base); hydrocephalus internus; cheesy glands at right bronchus. Disseminated tuberculosis of both lungs. Numerous cheesy conglomerated tubercles of the spleen and kidneys. tubercles of the liver.

MACROSCOPIC EXAMINATION OF BOTH PETROUS BONES
BEFORE THE TREATMENT WITH OSMIC ACID AND
DECALCINATION WITH CHROMIC AND NITRIC ACID.

Bony roof of both tympanic cavities very sclerotic, its mucous membrane thick and red. *Right* petrous bone: inspissated secretion on the walls of the osseous meatus. *Mt* destroyed as far as its periphery; hammer and anvil missing; stapes movable, but less than normal. Bony tube very narrow. Mucous membrane of the labyrinth wall grayish white; of the antrum pink, slightly thickened. The sloping portion of the tympanic cavity covered with pus.

Left petrous bone: In external meatus and tympanic cavity much liquid pus. Hammer and anvil wanting, stapes movable. Mucous membrane of the very narrow tube and of the antrum considerably reddened. *Mt* destroyed to its margin. From its lower border starts a cicatricial formation covering the whole labyrinth wall, which a later examination reveals to be epidermis "immigrated" from (originating in) the *Mt*.

MICROSCOPIC CONDITION OF THE MIDDLE EAR. THE RIGHT LABYRINTH WALL.

In some sections the foot-plate of the stapes was displaced laterally and its place filled by dense connective tissue growing from its inner surface, its hyperplastic interior periosteum being detached. To the right and left of this tissue were signs of recent inflammation. A broad dense band of connective tissue expanded over the entrance to the niche of the fenestra rotunda, very likely dating from the time of the scarlatinous otitis, not showing the fibrillar structure of the pseudo-ligaments, frequently met with as a product of the regressive changes of the mucous membrane of the labyrinth wall.

The epithelium of the niches of both fenestræ was destroyed by the terminal purulent otitis. The niches were filled partly with small and large celled granulation tissue, partly with pus cells, and in a lateral direction with a large quantity of polymorphous granular cells, stained black by osmic acid. *Normal epithelium* was found only in the mucous membrane between the entrance to the fenestra rotunda and the floor of the drum. The rest was *devoid of epithelium and of any cell-infiltration*. Epidermis connected the lower periphery of the *Mt* with the centre of the labyrinth wall. From there upwards to the semicanal for the tensor tympani the whole mucous membrane, except the lining of the niches, had become epidermoidal, and the entrance to both niches was bridged over by epidermis. The more minute conditions may be brought into two categories.

(1) Stratified, mostly cornified lamellæ of epidermis with rete Malpighii and papillæ in the same arrangement as in the external meatus.

(2) This was especially the case with the bridge between the facial wall and the head of the stapes: epithelial cells encapsuled in concentric lamellæ of horny epidermis; the whole bridge consists mostly of such microscopical cholesteatomata (Fig. 5).

SPECIAL CONDITIONS.—CYSTS.

In the mucous membrane of the labyrinth wall, 3 *mm* below the canal for the tensor tympani, was an oval *cyst* 1.5 *mm* long, 1 *mm* wide; its medial wall borders on the periosteum of the labyrinth, the periosteum of several sequestra being attached to its lateral wall. The contents of the cyst consist of colloid tissue and elements like amoeboid cells, very different from each other and mostly fatty degenerated. The interior wall is lined with low cylindrical epithelium. Another cyst of the same contents and epithelium was seated in the niche of the fenestra rotunda, 2 *mm* long, 1 *mm* wide.

MICROSCOPICAL CONDITION OF THE LEFT MIDDLE EAR.

An epidermis bridge, 2 *mm* long, passes from the lower border of the destroyed remnant of the *Mt* to the floor of the tympanum, and forms an arch towards the labyrinth wall. Covering the latter and bridging over the niches of the fenestræ it terminates above the lateral wall of the facial canal. The mucous membrane was destroyed down to the periosteum on 2 points from 2-3 *mm* in length. On some places of this bridge were epidermis-cells, stained black by osmic acid, apparently shed off and in a state of fatty degeneration. No signs of epidermoidal transformation, wherever the mucous membrane was destroyed. A wave-like formation of rete Malpighii projecting into the mucous membrane was found on the cochlear capsule under a thin stratum of epidermis. *Thus we have epidermoidal and "immigrated" epidermis next to each other on a relatively small area of the labyrinth wall.* The mucous membrane,

as far as preserved, showed a twofold condition, viz.: purulent infiltration in both niches of the labyrinth wall from the fenestra rotunda downwards to the floor of the drum, but no trace of vascularization or cell infiltration above the niche of the fenestra ovalis; an infiltration of black granules and polymorphous and black granular cells. Below the canal for the tensor tympani and on the foot-plate of the stapes they were densely crowded in an oval area of 1-2 mm in diameter.

Atrophy of the mucous membrane of the labyrinth wall.

In several hæmatoxylin-preparations some portions of the mucous membrane appeared lighter. They consisted of very light and very fine connective-tissue fibres as the result of a healed necrosis of the mucous membrane (from the scarlatina otitis).

Both intrinsic muscles of both sides.

The fibres of the tensor tympani were partly waxy, partly transformed into connective tissue, only very few normal left. The stapedius was totally replaced by connective tissue.

Recent osteo-necrosis in the middle ear: The osseous portion towards the niche of the fenestra ovalis showed fresh necrosis as far as to the horizontal wall of the ampulla and the *medial wall of the facial canal*, 3 mm in medial direction. The periosteum of the canal was detached, the neurilemma destroyed; $\frac{2}{3}$ of the nerve were green, $\frac{1}{3}$ showed osmium-staining without histological changes. In some sections of the petrous bones the necrosis at the surface and in the centre was *healed*. Fig. 4 shows both conditions, fig. 1 at *knk* only a central necrosis. The surface of the bone shows (in Fig. 4) more or less large lacunæ of connective tissue and large accumulations of granular cells between its meshes in the destroyed area. In the deeper layer of the hypertrophied mucous membrane sequestra are imbedded (Fig. 4) at *sq*. The healed central necroses (*gckn*) consisted of osteoid tissue, stained yellow by picrocarmin, and of connective tissue with only a few, but well-developed bone corpuscles. Habermann saw such healed necroses in purulent otitis media, after it had run its course.¹

¹ *Zeitschr. für Heilk.*, vol. xii.

CHANGES IN THE RIGHT LABYRINTH.

The auditory nerve is imbedded in pus from the porus acusticus internus to the fundus, partly infiltrated with blood, its fibres mostly destroyed. Of the vessels only remnants with their thickened walls are left. The facial nerve shows the same condition, though less pronounced. The ganglion geniculi is partly destroyed by ulceration, its cells intact. The suppuration reaches as far as the second bend of the nerve; the lateral wall of the Fallopian canal shows some defects of ossification. The nervus vestibuli and sacculi surrounded by pus. It is remarkable that the nerves, not destroyed by pus, were not stained by osmic acid, the two portions of the facial, described above, showing this different reaction very strikingly. The cochlea with its endosteum near the scala tympani is entirely destroyed, only the superficial layer of the spiral ligament is still preserved, but its osseous border half missing. The necrotic canal is partly filled with bone detritus, which scarcely contains any bone corpuscles. The modiolus to the cupula and the lamina ossea of the first whorl are involved in the suppurative process. The spiral ganglion contains mostly connective tissue, only a few ganglia cells, for the most part shrunken, and in some sections pieces of bone (Fig. 3). The missing nerve fibres of the first whorl and at the zona ossea are replaced by pus cells lying between the engorged blood-vessels. The endosteum of the scala tympani has become unravelled and is covered by a small zone of pus cells. The spiral ganglion thus cannot have been invaded by pus, which probably was propagated from the modiolus.

First whorl of the right cochlea.

The basal whorl is chiefly affected by a new-formation of bone in the scala tympani, caused by the scarlatinous otitis, reaching its highest degree in its centre, so that it is impossible to determine the limit between the new-formed osseous tissue and the cochlear capsule. The sections in the direction towards the fenestra rotunda exhibit the starting-points of the later ossification: 1. The endosteum of the tympanic surface of the lamina spiralis ossea. 2.

A new-formed layer of connective tissue arising from the membrane of the fenestra rotunda along its inner surface. 3. The layer of connective tissue of the spiral ligament. The ossified tissue runs from all directions toward the centre; the remaining free space contains the inflammatory products of the terminal affection. The vestibular portion of the lamina spiralis ossea is supplanted by connective tissue. In the ossified range very little of the structures of the ductus cochlearis was preserved. The basilaris membranacea was thickened and, as well as the scala vestibuli, covered by groups of granules or granular cells and detritus. The m. tectoria was wanting, Reissner's membrane preserved, the spiral ligament infiltrated with large round cells, the blood-vessels choked, a broad layer of pus cells along the region of the stria vascularis.

Condition in the non-ossified portion of the scala tympani.

In a net of finely fibrillated tissue few round cells, mostly large, some of seal-ring shape (Steinbruegge); some had a light space between their walls and protoplasma. Many communicated by their threads with others. In the upper portion of the basal whorl the endosteum was hyperplastic and infiltrated with pus. Numerous broad trabeculae of connective tissue infiltrated with pus, with new-formed engorged blood-vessels between them, traversed the scala tympani.

The vestibular apparatus.

The labyrinthine ligaments and partly the crista acustica, more or less infiltrated with small and large granulation cells and blood-vessels abundantly filled, especially at the sacculus. The ligaments of the frontal ampulla are perfectly destroyed, as well as the periosteum of the adjoining bone, through which a necrotic canal passes to the labyrinth wall. *The affection of the horizontal semicircular canal* is important (the two others were normal). The endolymphatic space is entirely, the perilymphatic mostly, obliterated; the surrounding bone irregular, sinuous. The endolymphatic space is filled with connective tissue, ossified on a small place, and blood-vessels. For more particulars see the description of Fig. 1.

THE CHANGES IN THE LEFT LABYRINTH.

Although the facial nerve from its second bend was stained black by osmium, it is peculiar that both nerves and a few twigs of the auditory nerve do not show any staining by osmium, but only by chromic acid. The purulent destruction of both nerves in the meatus aud. internus beyond the ganglion geniculi is more marked than on the right side. In regard to the destroyed ramus cochleæ of the first whorl see Fig. 3, *N*. The modiolus in several sections is perfectly corroded, and the suppuration extends to the third whorl. The ramus sacculi and the frontal ampulla are likewise infiltrated with pus. A fistula in necrotic bone encircling the spiral ligament, from the inner end of the porus acust. int. to the destroyed periosteum of the labyrinth wall, invaded partly the new-formed bone in the scala tympani.

First cochlear whorl (Fig. 3). The largest portion of both scalæ is ossified. In the remaining portion of the scala tympani: signs of recent inflammation, engorged blood-vessels, small extravasations of blood, large, round, and oval cells, communicating with each other by processes, imbedded in connective tissue, lymphoid and granular cells, and fine blue detritus. Reissner's membrane, half preserved, covered with granules. The sulcus spiralis internus filled with black granular cells (osmium); the lamina ossea atrophic, the vestibular portion consists totally, the tympanic partly, of connective tissue. From the remaining bone of the latter new-formed osseous fibres run into the scala tympani (Fig. 3).

LIGAMENTUM SPIRALE AND DUCTUS COCHLEARIS.

First whorl: Corti's organ almost entirely missing, only a nest of cell groups could be found. Reissner's membrane ruptured in the centre, the rest infiltrated with pus (Fig. 3 *rm.*). In the ductus cochlearis an accumulation of pus cells, but mostly large black granular cells. The connective tissue of the spiral ligaments partly thickened, blood-vessels very much injected, the whole ligament down to the bone infiltrated with pus. *Second whorl*: At its com-

mencement the intermediate stratum of the spiral ligament is destroyed. The innermost portion and Reissner's membrane, curved like an arch, are detached and displaced into the ductus cochlearis. The concavity of the arch is completely filled with a conglomeration of round apparently pavement-cells, arranged in mosaic form (undoubtedly mechanically). Corti's membrane is detached and forms a crescent over the crista spiralis. The sulcus spiralis int. is empty. Corti's organ wanting, further up the spiral ligament consists only of a string of connective tissue, almost attached to the membrana tectoria. The basilaris between crista and spiral ligament is displaced in form of an arch towards the scala vestibuli, covered with small round cells and black granules. Ganglion spirale and zona ossea normal. In the *third whorl* only a narrow strip of the periosteum of the spiral ligament was left, otherwise the same condition as in the second. *In both no trace of recent inflammation or suppuration.*

The left vestibular apparatus showed the following remarkable changes: The upper portion of the frontal semicircular canal consists chiefly of connective tissue and blood-vessels with thick walls, containing but little blood. The endo- and perilymphatic form a common space filled with material described above. In the lower portion the configuration of the lamina is normal, but the endolymphatic is half filled with large black granular cells. The perilymphatic ligaments and a portion of the bony enclosure are destroyed by recent suppuration. The nervous apparatus of the crista of the frontal ampulla is destroyed by pus, the cupula terminalis hidden (or destroyed?) by pus cells. On the ligaments of the horizontal ampulla and its meshes large, round, and oval cells and pus.

Both aquæductus cochleæ obliterated. The *aquæductus vestibuli* contained granular cells, and the bony wall was sinuous, probably from necrosis in consequence of the scarlatinous otitis.

EPICRITICAL REMARKS.

The changes found post mortem were mostly due to the *scarlatinous panotitis*, undoubtedly existing three years before

death: The destruction of both *Mtt*, the exfoliation of hammer and anvil in both, the dislocation of the stapes, the superficial and central healed osteonecrosis, the changes of the intrinsic muscles, the formation of cysts, the atrophy and epidermoidal transformation of the mucous membrane from the immigration of epidermis from the remaining *Mt.*, finally the granular cells on the labyrinth wall.

The following changes in the labyrinth must be attributed to scarlatinous otitis:

1. The new-formation of bone in the first whorl of the cochlea, the destruction or metaplasia of the lamina ossea into connective tissue, the destruction of Corti's organ, etc. The changes in the left second and third whorl are due to the *old* process. We think that the micro-organisms emigrated from the vessels of the cochlear endosteum, at the time of the scarlet fever, caused partly an irritation of the endosteum and consequently a new-formation of bone, partly necrosis and atrophy of the lamina ossea and the structures of the ductus cochlearis. Besides the atrophy of the ganglion spirale on one side and the nerves of the zona ossea on both, the above changes in both cochleæ were sufficient to produce *total deafness*.

2. The changes in two semicircular canals of one side and one on the other. Referring to my former descriptions of changes in the semicircular canals in these ARCHIVES and *Virchow's Archiv*, vol. cxxiv., I do not hesitate to explain these changes as *originating in giant cells, and the wavering character of the clinical picture as produced by the morbid process in the semicircular canals in both petrous bones*.

As the *result* of the *terminal affection* the following is to be considered:

1. The recent purulent inflammation in the niches of both fenestræ. It is remarkable, that the greatest portion of the mucous membrane of the labyrinth wall, transformed into epidermis, was not only free from any recent inflammation, but even without cell-elements and any vessels to speak of. The epidermoidal integument certainly offered a great resistance to the invasion of micro-organisms from without, although, as proven by me (*Deutsche med. Woch.*, 1891, Nos.

11 and 12), the microbes find a favorable culture-soil in the *epithelial cells* of the developed cholesteatoma, complicating it very much.

2. The *recent necrosis* of the facial canal and the niche of the fenestra ovalis.

3. The bilateral necrosis of the cochlear capsule and the partial destruction of the osseous tissue, newly formed in the former affection, in the scala tympani of the first whorl of the right cochlea.

4. The more or less extensive inflammation of both vestibular apparatus.

5. The destruction of the auditory nerves and a portion of the facial nerves by suppuration and hemorrhages, with their consequences for the modiolus, the non-ossified portion of the first whorl, the endosteum of the scala vestibuli and the spiral ligament. The almost symmetrical necrosis of both cochleæ from the porus acusticus internus to the labyrinth wall, shows the possibility of a secondary bilateral otitis media starting from the labyrinth. The missing cellular or purulent infiltration at the perforation of the labyrinth wall seems to speak against a course in an opposite direction.

THE MORBID AGENTS OF THE TERMINAL AFFECTION.

According to the investigation of Foà and Bordone-Uffreduzzi,¹ Fraenkel,² Netter,³ Weichselbaum⁴ and Schwabach,⁵ the diplococcus pneumoniæ (A. Fraenkel) is supposed to be the *producer* of *cerebro-spinal meningitis*. On the other hand, Bonome⁶ found in a small epidemic of cerebro-spinal meningitis a new species of streptococcus with qualities differing from the micro-organisms so far known as the excitants of inflammation. Huguénin⁷ found in the exudations of *pri-*

¹ *Deutsche med. Woch.*, 1886.

² *Zeitschrift f. klin. Med.*, 1886, p. 437; *Deutsche med. W.*, 1886, No. 13; *Berl. klin. Woch.*, 1886, Nos. 22, 23, 24.

³ *Arch. gén. de Méd.*, 1887.

⁴ *Monatsschr. f. Ohrenh.*, 1887, No. 9.

⁵ *Zeitschr. f. klin. Med.*; vol. xviii., Nos. 3 and 4.

⁶ A. Bonome: "Zur Aetiologie der Mening. cerebro-spin. epid.," *Ziegler's Beiträge*, vol. viii, p. 377.

⁷ "Infectionswege der Meningitis; I. Die Infectionstraeger," *Correspbl. f. Schweiz. Aerzte*, 1889, No. 22.

mary and *secondary* meningitis: staphylococcus pyogenes aureus, streptococcus pyogenes, bacillus meningitidis Neumann Schaefer, pneumococcus Fraenkel, bacillus meningitidis intracellularis. Weichselbaum, Goldschmitt, and Adenot¹ found Friedlaender's pneumobacillus and the typhoid bacillus. Mine is a case of purulent meningitis (basilaris and convexitatis), whether primary or secondary, is difficult to decide; the latter is more likely. I found a staphylococcus (Fig. 4) as the morbid agent between the fibres of the auditory nerve in the porus acusticus internus and in the canalis centralis modiolii, in the necrotic bone of the right cochlear capsule. No cultures were made, so that it could not be ascertained whether it was staphylococcus aureus or one of the other species. Considering its well known intensive action causing suppuration, the extensive ravages of the terminal affection are not surprising. No tubercular bacilli were found anywhere. The aggregation of lymph cells in the scala tympani of the first whorl of the cochlea may be mentioned as due to a mechanical action of the immigrated micro-organisms.

Explanation of Figures.

FIG. 1. Sagittal section through the medial portion of the horizontal semicircular canal of the left petrous bone. Hartnack $\frac{3}{4}$, tube o. Stained with osmium-picrocarmin. The endolymphatic space is completely obliterated, the perilymphatic mostly. No sharp-edged osseous border as in the normal. The edge is alternately convex and concave, irregular in consequence of former necrosis, the result of which may be traced far into the adjoining bone at *k n k*. The remaining small perilymphatic lumen is mostly filled with blood corpuscles and granular cells, stained black by osmium. The rest consists of more or less dense connective tissue covered by round cells with one nucleus only on the very light places (to the right in the drawing), and blood-vessels either empty or filled with blood corpuscles or fatty detritus black by osmium. The place pointed out by the arrow is represented in

FIG. 2. (Hartnack $\frac{3}{4}$, tube o.). It was the only one which showed more marked staining with carmin and commencing new-formation of bone.

¹ *Des Méningites Microbiennes. Avec 8 figures.* Paris, 1890.

Fig. 3. From a sagittal section through the left cochlea. First whorl. Osmium-picrocarmin. Hartnack $\frac{1}{2}$. Tube o. N = trunk of the nerve of the first whorl, infiltrated with hemorrhages and pus. g = blood-vessel with thickened wall; $r g s p$ = region of spiral ganglion shrunken by the propagation of the ossification in the cochlear scalæ in centripetal direction. The ganglion itself is traversed by bone processes; the rest consists of connective tissue and shrunken ganglia cells. $S t$ = scala tympani, its lumen nearly obliterated by ossification, the remaining portion filled with connective tissue and blood-vessels. $S v$ = scala vestibuli, of which a great portion is filled with newly formed osseous tissue originating in the endosteum. In the free lumen a remnant of the detached Reissner's membrane, = $r m$ without its cellular attributes, is visible from the surface, instead of from the side; molecular detritus, a small and a larger conglomeration of lymph-cells, the larger shows clearly a stratified arrangement. $L s p$ = ligamentum spirale, consisting of osteoid tissue. $C r s p$ = crista spiralis; Corti's organ, situated between the two, is missing. $L s p o$ = lamina spiralis ossea, abnormally curved; the light stripe between its two portions is the optical appearance of the atrophied nerves of the zona ossea.

FIG. 4. From a sagittal section through the labyrinth wall of the left petrous bone in the direction toward the niche of the fenestra ovalis. Osmium-picrocarmin. Hartnack $\frac{1}{2}$, tube o. $N o$ = niche of the fenestra ovalis. $S t p$ = foot-plate of the stapes. $g c k n$ = healed central osteonecrosis. $N f$ = nervus facialis. $R p l$ = branch of the plexus tympanicus running under the epidermoidal mucous membrane. $s q$ = three sequestra of different sizes and forms covered by hypertrophied mucous membrane. $h e$ = horseshoe limit of a former superficial necrosis of the labyrinth wall, filled with dense connective tissue. It shows still some lacunæ from former decay and some black foci (osmium) of granular cells. The configuration of the remaining bone shows the characteristic necrosis as well as, even in a higher degree, the lateral osseous wall of the Fallopian canal. In a lateral direction from the latter, smaller and larger conglomerations of granular cells are situated. The mucous membrane in the niche of the fenestra ovalis lost its epithelium. Its surface consists of several lamellæ of epidermis. It is infiltrated throughout, partly with large fatty degenerated elements without nuclei and showing no staining, partly with granular black (osmium) cells.

FIG. 5. From an epidermis-bridge between the lateral wall of the facial canal and the capitulum of the stapes. Sagittal section. Hartnack $\frac{1}{8}$, tube α . A single horny stratum under which numerous differently shaped cells, containing mostly nuclei cut in different directions. A large portion, mostly of cells without nuclei, is encapsuled by one or more concentric lamellæ of epidermis. The encapsuled portions are round, oval, and of very different sizes.

FIG. 6. Micrococci and staphylococci from a necrotic bone fistula of the left cochlear capsule. Gram. Xylol Canada, Leitz immersion $\frac{1}{8}$, tube o.

REMOVAL OF THE STAPES.

By CLARENCE J. BLAKE, M.D., BOSTON.

THE clinical experiences of various observers in regard to the mobilization of the stapes which have been recorded from time to time, together with recent observations of an experimental character made upon animals, some of them a continuation of work already done, have led otologists to the serious consideration of a further and more conclusive step in the surgical treatment of chronic non-suppurative disease of the middle ear by the removal of the stapes. The reasoning by which this conclusion has been reached, and which will probably be found on comparison of their work to have been simultaneously carried out by many different investigators, is one following what has been the natural sequence of operative procedure in the middle ear for many years, from the outer limit of the sound-transmitting apparatus, the membrana tympani, inward to the final member of the ossicular chain.

So far as the question of the possibility of the operation was concerned, experience in the removal of the two larger ossicles, and also of the accidental evulsion of the stapes in cases of suppurative disease of the middle ear, either in the progress of the suppurative process, or incidentally to the removal of the other bones, or of granulations, gave favorable indications both as to comparative freedom from danger to the patient and possibility of improvement to the hearing from this procedure, while the report of cases of mobilization of the stapes, either intentionally or accidentally, as consequent upon the removal of the larger ossicles

in chronic non-suppurative disease of the middle ear, still further pointed in the direction of the ultimate step in surgical interference with the sound-transmitting apparatus. In confining the consideration of this subject in the present paper to the question of the operation of "stapedectomy," as it may be called until a better title is offered, in cases of non-suppurative disease of the middle ear, it should be had in mind that the subject opens up a wide field for investigation, and one which, to be properly covered, should enlist the services of the anatomist and pathologist, as well as the clinical observer and that it and the studies which it will suggest cannot fail to lead to a better understanding of many hitherto obscure changes occurring in the middle ear in consequence of non-suppurative disease, and to their remedy by other and already familiar surgical means, as well as by the resort, in appropriate cases, to stapedectomy itself. A step in this direction, and one which would naturally suggest itself to any aural surgeon of experience in the performance of middle-ear operations, and which affords an opportunity for that process of diagnosis by elimination often of so much importance in doubtful cases, is the performance of the preliminary exploratory incision of the membrana tympani and the subsequent operations, including stapedectomy, under cocaine and without an anæsthetic, for it is evident, on even a cursory mental review of the pathology of the middle ear in chronic middle-ear disease, that changes seriously impairing the transmission of sound may occur in one part or another of the ossicular chain, the articulations, the fenestral attachment of the stapes, or the membrane of the round window, and escape detection except upon subjection to such direct inspection and test of the hearing power and of the patient's subjective symptoms as an operation upon the middle ear under conditions of consciousness and freedom from pain would afford. The subject of impaired mobility of the ossicular chain and of ankylosis, especially of the stapes, is one which has received interested attention from the time of Morgagni in 1766 and Meckel in 1777, through a long line of observers, including Toynbee, Boonafont, Kessel, Politzer, Gruber,

Lucae, Gellé, Baracz, Miot, Boucheron, Schwartz, Moos, and others, but the first serious consideration of an attempt to relieve or remove this obstruction to the passage of sound at the oval window by removing the stapes itself is, so far as I am aware, to be credited to Kessel,¹ who, in 1871, removed the stapes and columella in dogs and pigeons respectively and, in the human subject, after dividing the tendon of the stapedius, circumcised and mobilized the stapes and, as the result of this experience, then expressed the opinion that a still better result would have been attained had the stapes been extracted and a membrane allowed to form in the oval window, which would vibrate more readily than the stapes even under the condition of mobilization in which it was left by the operation of circumcision.

The accuracy of opinion as expressed by Kessel has since that time been confirmed in several instances by the accidental evulsion of the stapes at the hands of different observers and in my own experience, and without doubt in that of others also, by definitely planned operations for this purpose.

The simplicity of the operation of stapedectomy itself does not imply the permissibility of any lack of precaution as regards antisepsis, or as to the extent of the interference with the tympanic cavity, and in both of these respects every care should be taken. The ear to be operated upon should be first carefully tested as to its hearing power, both by aërial and bone-conduction, and with due reference to the possibility of sound transmission either by aërial or bone-conduction to the other ear.

The external auditory canal should be cleansed of cerumen and loose skin and then washed with a weak bichloride solution on a cotton-tipped probe and stopped with antiseptic cotton until the time of the operation. The instruments need be only such as are found in any well equipped aural clinic, namely, a paracentesis needle, a small angular knife for the division of the articulation of the incus and stapes,

¹ Kessel, *Sitzber. d. Ver. d. Aers.*, in Steirmark xiii., 1875.

a small blunt hook and a pair of light but strong angular forceps ; there may be added also a small rectangular knife to be passed between the incus and stapes, after division of the joint, to make sure the separation is complete, and a pair of very fine straight-tipped forceps to be passed into the stapedia niche if necessary for the removal of a portion of the bone in case of fracture in the attempt at extraction. These instruments, preferably made to fit into angular handles, of which there should be as many provided as there are different instruments in order to facilitate speed in operating, are placed at the right of the operator on a table with a glass top suitably cleansed or upon a sheet of paper or cloth ; there should also be at hand a number of cotton-tipped probes, a small bowl containing a weak bicarbonate of soda solution, and also, in wide-mouthed bottles or glasses a saturated solution of boracic acid in alcohol, one of a 10 per cent. and another of a 20 per cent. solution of cocaine. The specula, having first been thoroughly cleansed, are filled with antiseptic cotton until required for use ; the hands of the operator and of an assistant, if one is present to pass the instruments and roll the cotton upon the probes, should be washed and sterilized, as should also parts about the ear of the patient with which the surgeon's hands come in contact. By dipping the instruments just before using them in the alcohol and boracic acid solution the resulting white deposit of the acid gives the instrument a dull surface and makes it, especially in a strong light, more plainly visible, by preventing reflections from the polished steel.

From three to five minutes before the operation a few drops of a 10 per cent. solution of cocaine are forced into the Eustachian tube through a catheter ; the patient is then seated erect in a high-backed chair, his head being firmly held by an assistant, this method being found preferable to the recumbent position and to mechanical support for the reasons that with the patient's head erect it is much more easy for the operator to determine the relative positions of the parts of the middle ear exposed by operation and the angle of attachment to the stapes, a very variable one and of importance from an operative point of view, and that the

position of the head can be adjusted at command as the operation proceeds.

The first step in the operation itself, the incision of the membrana tympani, may be made with the paracentesis needle, and the cut which I prefer, after having tried both the triangular and small semilunar flaps, is the one which I have heretofore used for mobilization of the stapes, and is a modification of that of Miot—but is an incision merely and not an excision of the membrana tympani, and begins at a point midway between the short process and the tip of the long process of the malleus and close to the manubrium, then extends upward along the posterior ligament of the short process and follows the periphery to a point posteriorly on a line with the tip of the manubrium, or it may begin at the point last mentioned and be carried in the opposite direction, in either event the result being the same in the formation of a large flap which falls downward and outward leaving an unencumbered opening with free access to the subsequent field of operation; bleeding from the edges of the cut is stilled by the application of a sterilized cocaine solution, the hearing is tested if desirable, and the operation is continued, the next step being the division of the tendon of the stapedius by means of a paracentesis needle or the short curved knife of Kessel or Miot or if the stapes is situated forward and in full view the division first of the incudo-stapedial articulation, which is done by means of a small angular knife, a larger angular knife being subsequently passed behind the incus to insure separation. If it has been decided to remove the incus as well as the stapes, either for the purpose of obtaining better access to the latter bone or because the articulation of the incus with the malleus has been ruptured in the process of dividing the incudo-stapedial articulation, it may be done at this point of procedure, the large flap opening made in the membrana tympani being adequate to this as well as to other possible contingencies of the middle-ear operation.

An examination of the stapes by means of a probe and blunt hook and a repetition of the hearing tests help to

determine at this stage of the proceeding whether the stapes shall be merely mobilized mechanically, by division of folds in the niche or by circumcision, or whether it shall be extracted. In the former instances the usual measures, as given by Kessel, Schwartze, Miot, and others, may be followed; in the latter the stapes should be first mobilized and then extracted, the best instrument for this purpose being a slender, blunt hook, curved very slightly backward, which is passed behind the head and between the crura either from below upward, or in the opposite direction, the latter being often the more convenient, especially if the stapes has been previously well mobilized. The resistance offered to the traction of the hook varies considerably, as would be expected, in different cases: where the stapes comes away entire, there is first a sense of contact resistance, followed by a sense of suction, resistance occurring presumably at the moment of separation of the base-plate from the window, where however, as in the cases of atrophy of the crura, the latter break, leaving the foot-plate in position, the contact resistance alone is felt. At the moment of removal of the stapes there is, in the majority of cases, a decided change in the character and rate of the pulse, which becomes smaller and either increased or decreased. Vertigo is not necessarily present, but should always be regarded as a contingency, and possibly a protracted one. The principal hemorrhage, aside from the bleeding of the membrana tympani, is that which occurs on the division of the tendon of the stapedius, and the use of a fine cotton-tipped probe at that moment prevents the filling of the niche with blood. After the operation the ear should be tightly stopped with sterilized cotton or gauze, and the patient kept quiet for two or more days.

The following are presented as illustrating two types of cases, the one in which the stapes is fractured, and the other in which it, together with the incus, is successfully removed, both being done under a method of procedure which, availing of the patient's intelligent co-operation, is valuable for purposes of diagnosis by elimination during

operation as well as for the operation itself in chronic non-suppurative middle-ear disease with a view to the improvement of hearing.

The first case was that of a man twenty-nine years of age, first seen in October, 1878, with a history of impairment of hearing in both ears following typhoid three years previously; the hearing had subsequently improved, but had again decreased in consequence of head colds. At that time both membranæ tympani were slightly opaque, and the hearing in both ears for a watch, tuning-fork, and voice was much less than the thickening in the middle ear, as judged by the opacity of the membranæ tympani, would apparently warrant; the watch was not heard on contact, and the voice in a moderate tone only within a foot of each ear and better in the right; the hearing by bone-conduction was good in both ears.

A diagnosis of thickening of the tympanic mucous membrane, especially about the stapes, was made, a prognosis of possibly slight improvement only was given, and treatment of the middle ear by means of the catheter with stimulating vapors was begun and continued at intervals for three years, but without appreciable improvement.

In October, 1881, it was decided to attempt mobilization of the stapes, and this was done through a crescentic incision in the posterior-superior segment of the membranæ tympani, with a result of slight improvement in hearing aërially, which lasted three days and then gradually decreased. Subsequently treatment, including care of general health, occasional use of the Eustachian catheter, and more or less continuous massage (Hom-mell's procedure) resulted apparently in a maintenance of the hearing in the right ear, the left ear having become comparatively useless.

It was finally proposed to resort to the operation of stapedectomy in the left ear, and as the case was one which had been followed with care in its observation, it was decided to do the operation under conditions which would permit testing both the hearing and the tactile sense of the patient during the operation. Personal experience as well as the recorded observation of others having shown the inefficiency of cocaine instillations in the external auditory canal for local anæsthesia, it was decided to make the first incision in the membrana tympani

under the influence of cocaine introduced per tubam, and to follow this up by further cocainization of the middle ear through the incision, should that be necessary, previous experiments made in tenotomy of the stapedius, disarticulation, circumcision, and mobilization of the stapes having shown these parts to be exceedingly tolerant of interference so far as painful sensation was concerned.

The operation was substantially that above described.

The cut in the membrana tympani caused no pain, and the hearing tests which had been made before the operation and were now repeated, gave the same results. Politzer's acoumeter was heard when held so close to the ear that the hammer was on a line with the posterior border of the concha; the tuning-fork, 512 v. s. (single vibrations), was heard aërially $\frac{3}{4}$ ths, and by bone-conduction $\frac{3}{4}$ ths; Politzer's forks Nos. 1 and 2 were not heard aërially, nor was Galton's whistle, ranging from 6,000 v. s. to 12,000 v. s., this examination proving that the resistance to the sound waves was to be sought at the farther end of the ossicular chain.

The remainder of the operation was painless, except when the shaft of the instrument touched the cut edges of the membrana tympani, but was accompanied by the auditory sensations with tenotomy and disarticulation already described.

Efforts¹ at mobilization showed the stapes to be firmly fixed, and in an attempt at circumcision by means of a fine paracentesis needle the knife met with bony resistance on the superior and posterior borders of the niche, and gentle traction, made with a blunt hook, resulted in the coming away of the head and both crura of the stapes, broken off close to the foot-plate. There was no sense of suction on this extraction, no vertigo, no change in pulse, and no special sensation on the part of the patient except a snapping noise which was presumably heard at the moment of fracture. Investigation of the fenestral niche by means of the probe showed the base-plate to be apparently fixed by bony union, especially to the posterior and superior walls, the surface of the base-plate also seemed to be roughened; and this condition, taken in connection with the subsequent examination of the crura, which showed them to be distinctly atrophied, placed this case in the class described by Schwartze, where

¹ Parts of this and the next case have been published in *The Boston Med. and Surg. Journ.*

atrophy of the crura follows long-continued anchylosis of the base-plate of the stapes.¹

The whole operation, including the tests made in its progress, lasted but twelve minutes, and was without pain to the patient, who was, however, it should be said, a well man of an equable temperament. Five days after the operation, during which interval there had been neither pain nor other discomfort, the hearing-tests in the left ear gave the same results for Politzer's acoumeter and for the duration of the tuning-fork aërially, but the hearing was improved in the following respects: Galton's whistle, previously not heard at all, was now heard throughout its whole register; the tuning-forks (Nos. 1 and 2) were heard plainly, as was also the voice in a low tone close to the ear; a loud voice, however, even if one or more feet distant, was heard only confusedly, though with the facility acquired through long deafness the sentences used in testing were construed rather than heard, a circumstance which illustrates the importance in voice tests, not only of reproducing the voice with as nearly as possible the same pitch and intensity, but also of constructing the test sentences with a deference to the force value of the consonant sounds.

In the second case, that of a woman fifty-five years of age, the operation included the removal not only of the stapes, but the incus also. She was first seen in April, 1876, on account of chronic catarrhal inflammation of both middle ears, the hearing distance at that time being for Politzer's acoumeter in the right ear 2 centimetres, and in the left ear 25 centimetres. Under local treatment the hearing in both ears at first improved, but subsequently decreased until at the time of the operation the acoumeter was not heard in the right ear, neither the upper portion of the scale of Galton's whistle, nor the tuning-fork 512 v. s. was heard. As the hearing in the left ear was also materially decreased, it was decided to operate upon the right ear. The incision in the membrana tympani was the crescentic peripheral cut already described, and was made with comparatively little discomfort, the only further use of cocaine in addition to the first injection consisting in its application to the edges of the cut, care being taken not to carry it into the ear.

¹ Schwartze: *Pathological Anatomy of the Ear*, translated by J. Orne Green, M.D., p. 120.

Tests of hearing at this stage of the operation showed no improvement or change, either by aërial or bone-conduction, and served to confirm the diagnosis of fixation of the stapes in consequence of the long-continued thickening process in the middle ear. Careful tactile examination of the accessible portions of the inner tympanic wall, especially in the neighborhood of the fenestral niche, by means of a probe, showed lack of sensitiveness to touch, with exception perhaps of a slight pricking sensation ; if, however, the probe came accidentally or intentionally in contact with the cut edges of the membrana tympani, especially on its superior posterior margin, there was sense of discomfort, which amounted to pain as the effect of the cocaine passed off, which it apparently did before the more important part of the operation was continued, and care was therefore taken in subsequent manipulations to avoid touching the edges of the opening of the membrana tympani. Under these conditions the operation continued and was completed, including the tenotomy of the muscle, disarticulation and removal of the stapes without pain to the patient. The division of the muscle caused a sensation of a dull thud to the patient, and in dividing the articulation between the incus and the stapes, the grating sound made by the knife was distinctly heard. The ankylosis at this point was very firm, and the disarticulation was effected with such difficulty that at its completion the incus dropped, not only outward, but also slightly downward, in such a manner as to show that it was separated from the malleus also ; under this condition its removal seemed advisable, and this was easily done by means of the blunt hook and forceps, the only pain caused being incident to the passage of the body of the incus through the opening in the membrana tympani. The stapes was now plainly in view : and as no improvement in hearing had been so far effected, this bone was also extracted by means of the blunt hook passed between the crura from above, and came away with the sensation to the patient of a loud report, but without causing either pain or vertigo ; the pulse, which had been 80, rose to 100 and became weaker, but returned to its former rate and volume within two minutes.

Subsequently to the operation, in both of the above cases there was no other discomfort than that naturally incident to holding the head in a constrained position ; and in this respect, as well as in the conditions of the operation itself,

the result was a satisfactory one. Indeed, the use of the cocaine may, in most cases of middle-ear operation of the above class, be limited to the region of the membrana tympani, and may therefore be introduced through a preliminary incision, as has been heretofore done with similar openings made for simple mobilization of the ossicula. In an operation of this kind begun under cocaine, there is also always the alternative of recourse to ether or chloroform should the local anæsthetic fail of its effect or the patient find the restraint of self-control too great an effort.

(To be continued.)

REPORT ON THE PROGRESS OF OTOLOGY DURING THE FIRST HALF OF THE YEAR 1892.

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Translated by Dr. MAX TOEPLITZ, New York.

FIRST PART: ANATOMY AND PHYSIOLOGY.

By AD. BARTH.

A.—ANATOMY.

a.—ORGAN OF HEARING.

1. SANDMANN, G. Colored plate of the human hearing organ, with explanatory text. Published by Boas & Hesse, 1892, Berlin.
2. SIEBENMANN, F., Bâle. The metal corrosion of Semper's specimens of the ear, with three plates. *Anatomische Hefte*, No. 3, 1892.
3. WEICHSELBAUM'S *Elements of Pathological Histology*, Part xiii. *Hearing Organ*, by Dr. B. GOMPERZ. Published by Deuticke, 1892.
4. TISCHKOW, W. *Othæmatoma*, St. Petersburg, 1891. (Reviewed in *Neurolog. Centralbl.*, 1892, p. 28.)
5. GOMPERZ, B. Contribution to the study of regeneration of the substantia propria in cicatrices of the membrana propria.
6. SCHEIBE, ARNO. Influenza bacilli in otitis media. *Münch. med. Wochenschr.*, 1892, No. 14.
7. SALA, L. The origin of the acoustic nerve (sur l'origine du nerf acoustique). *Arch. Ital. de Biol.*, vol. xvi. (Reviewed in *Neurolog. Centralbl.*, 1892, p. 200.)

8. Prof. VON BECHTEREW. Contribution to the study of the striæ medullares of the medulla oblongata. *Neurolog. Centralbl.*, 1892, p. 297.

1. The plate supplies a want of the teacher. It contains all that may be demonstrated in one specimen of the anatomy of the ear.

2. SIEBENMANN gives two illustrations of each right and left hearing organ in the child and in the adult, taken from dry corrosion specimens—and three illustrations of corrosion specimens of the soft parts of the middle ear.

3. This is a brief treatise of the entire pathology of the ear, in which the most important facts are described in a pleasing style.

4. The name of othæmatoma is used for different affections of the auricle. The true othæmatoma occurs almost exclusively in progressive paralysis and offers an unfavorable prognosis. TISCHKOW observed ten cases, five of which occurred in paralytics. The microscopical examination demonstrated the fact, that in the aural cartilage of paralytics new formation of blood-vessels takes place, which grow from the perichondrium into the cartilage. The elastic fibres frequently lose their gloss and the cells undergo fatty degeneration. These changes may advance to partial necrosis of the cartilage. The blood extravasation being within the cartilage, absorption proceeds slowly. Hence follows the author's view, that hæmatoma may develop spontaneously without trauma.

5. GOMPERZ, in a petrous bone of an adult, found a large portion of the membrana tympani replaced by cicatrix. It was three times thicker than a normal membrana tympani at the same place. This thickening essentially involves the membrana propria, which consists only of radiary fibres. Complete replacement of the destroyed membrana tympani by another membrane was found by Gomperz in one per mille.

6. SCHEIBE, as in twelve cases two years ago, demonstrated this year in three additional cases of fresh influenza otitis, the constant occurrence of bacilli, which, when compared with Buchner's specimens are positively considered as influenza bacilli.

7. Deiter's nucleus, the nucleus angularis or Bechterew's nucleus, and also the cells of the so-called inner acoustic nucleus

do not bear any relation to the acoustic nerve. The nuclei from which the acoustic originates, are rather the so-called anterior nucleus and the tuberculum laterale. SALA made his investigation in the new-born cat and in the bovine embryo.

8. The striæ of cats and rabbits are not analogous to the striæ medullares of man. They cannot be considered in man a direct continuation of the acoustic nerve, but they form either secondary paths arising from the tubercular acusticum or they have nothing in common with the acoustic. BECHTEREW holds the latter view; neither do they bear any relation to the funiculi teretes, to the pneumogastric, the glosso-pharyngeus, and trigeminus. They most probably constitute a connection of the basal portions of the cerebellum.

b.—MIDDLE EAR.

1. CHATELLIER. Anatomy of the middle ear. Presentation of serial sections (anatomie de l'oreille moyenne. Présentations de pièces coupées en série). *Soc. Paris de laryng. et otol.*, 1892, February.

1. CHATELLIER explains the technique of his sections presented to the society (decalcification in Müller's fluid and formic acid, embedding in celloidin, staining with eosin-hæmatoxylin). He aims principally at demonstrating the position and extent of the attic and to prove that it is separated from the tympanic cavity posteriorly as well as anteriorly. The points of separation in the antero-posterior direction are as follows: the osseous plate separating the attic from the external auditory meatus, the projection of the margin of the membrana tympani, the ligamentum externum of the malleus, the neck of the malleus or the lower portion of the head, the tendon of the tensor tympani spreading toward the promontory, and the processus cochleariformis.

GELLÉ.

c.—NASO-PHARYNGEAL CAVITY.

1. ZARNIKO, C. Contributions to the histology of nasal tumors. (From Dr. Hartmann's clinic for nasal and aural diseases.) *Virchow's Archiv*, 1892, vol. cxxviii.

1. The masses removed from the nose and naso-pharynx of a patient consisted partly of œdematous fibromata, partly of tumors, which were distinguished from those by irregular cristæ, villi-

noduli, and intermediate sulci and grooves. The latter are covered, in addition to the cylindrical epithelium of the nasal mucous membrane, with plaster epithelium, especially marked by its thickness. It is considered as developed from cylindrical epithelium by chronic inflammation. ZARNIKO found among forty-nine benign new-formations, seven containing noduli, which extended directly from the turbinated bone into the tumor and are therefore to be considered as exostoses. Hence it follows that fibrous nasal tumors can no longer be considered as developed exclusively from proliferation of the mucous membrane.

B.—PHYSIOLOGY AND PHYSICS.

a.—HEARING ORGAN.

1. ZWAARDEMAKER. De Omvang van het gehoor als analogon van het gezichtsveld. (The extent of hearing as the analogue of the field of vision.) *Cz. Nederl. Tydschr. voor Geneeskunde*, 1892, part i, No. 16.

2. MARTINS. The time of reaction and the duration of perception of sounds. *Philosoph. Studien*, vol. iv., p. 394.

3. STEINER, J., Cologne. Spheres of senses and movement. *Arch. f. d. ges. Physiol.*, vol. L.

4. BONNIER, P. Perception of space in auditory sensations. (Perception de l'espace dans les sensations auditores) *Comptes rendues de l'Acad. des Scienc.*, October 26, 1891.

5. MILLS, CHARLES K. On the localization of the auditory centre. *Brain*, winter part, 1891. (Reviewed in *Neurol. Centralbl.*, 1892, p. 145.)

6. JACOBSON, L. Some novel apparatuses and instruments for galvano-cautery and electric illumination. Demonstration in the Berl. Medic. Gesellsch. *Berliner Klin. Wochenschr.*, 1892, No. 13.

7. MELDE, F. The determination of the velocity of transmission of sound in membranous bodies. *Annalen der Physik und Chemie.*, new series, vol. XLV., pp. 568 and 729, 1892.

1. ZWAARDEMAKER represents the extent of the perceptible sounds from the highest to the lowest by a line which he divides into four parts. The graphic conception of hearing is determined: 1, by the length of the line of hearing; 2, by its absolute position in the physical gamut. In order to represent both, a rectangle is erected upon the line of hearing, the vertical of

which is divided, according to the age, into five principal parts. In marking here the lines of hearing, as they present themselves under normal conditions with increasing age—slight decrease of the low sounds and more rapid of the high ones—the clinical cases can thus be inserted schematically. It greatly resembles the representation of a grain field, but does not give a clear idea of all forms of deafness.

2. The periods of reaction of sounds decrease steadily with increasing pitch. It is incorrect that, apart from the pitch of the sound, about ten vibrations are required for the production of a perception of sound. The duration of perception of sounds in the large extent of the gamut (C' to C') depends upon their figures of vibration. It is doubtful whether we have to assume as the cause of this condition, that the excitation of the organ of perception or of the central substance does not transcend the threshold except after about three vibrations, or that the leading or central parts are excited at different intervals which are to be imagined as dependent upon the different velocity of the impulses.

3. STEINER could produce in pigeons ocular movements by electric irritation of the cerebral cortex, with exception of a small strip in the foremost and also in the hindmost portion. One cerebral side thereby acts upon both eyes, viz., in irritating the right cerebral half the right eye is moved forward, the left backward, and conversely. In addition, upon irritation of the cortex energetic contraction of the pupil of the opposite eye always takes place. As immediate consequence of the ocular movements, those of the head appear. In rabbits, the phenomenon discovered in dogs by Baginsky could be confirmed, that in irritations of one hearing sphere the opposite ear is moved. Movements of the head though were missing.

4. The different convergence of the sound-waves causes the membrana tympani to be moved in different ways. The transmission of this movement by means of the peculiar connection of the ossicles upon the labyrinth makes possible the perception of the direction of sound in the vestibule and the semicircular canals.

5. This is the description of a post-mortem examination of a woman, who, thirteen years previous to her demise, had been seized by word deafness and paraphasia with preservation of the knowledge of letters and of the faculty of writing, and nine years previous to death became entirely deaf with partial paralysis of

the left upper extremity. The autopsy revealed a bilateral lesion of the first and second temporal convolution. Mills arrives at the following conclusions : 1. The centre of the conception of words is situated on a level with the posterior end of the horizontal branch of the fossa Sylvii. It may perhaps be limited to the second temporal convolution. 2. The three remaining temporal convolutions do not take part in hearing. 3. A lesion of the left posterior end of the first and second temporal convolution produces more or less complete word-deafness, if the corresponding parts of the other hemisphere are intact. 4. The fields of all remaining auditory pictures of memory embrace a much larger province than that of the sensory word memory, viz., at least the last two thirds of the first and second temporal convolution. 5. In the left hemisphere the hearing centre and the special auditory centres of memory are more developed than in the right (N.B. in the right-handed.—Reviewer) ; but for complete deafness a lesion of the hearing centres of both hemispheres is required. 6. A lesion of the centre for the conception of words produces *per se* paraphasia and paralexia.

6. JACOBSON recommends for galvano-cautery an accumulator weighing $2\frac{1}{2}$ kilogrammes which is not filled with fluid. It produces also in large burners and snares white heat. The price is 30 marks. He recommends as a source of current for galvano-cautery and electroscoy an accumulator weighing 6 kilogr. at the price of 60 marks. For continued and frequent use the larger apparatus is preferable. Furthermore he describes an electric forehead lamp and burners made aglow at the extreme end only. The instrument may be ordered from Hirschmann of Berlin.

7. MELDE examined the velocity of sound in various membranous bodies, attaching them in an original way in glass tubes, rubbing them with gloves covered with colophonium, and determining the velocity according to Kundt's dust figures. He distinguished eight groups of bodies according to their structure. It followed from these experiments, that there exists a great difference not only by the structural difference, as *e. g.* between tissue and blotting paper, but that the conduction becomes at once much more retarded, principally in membranes, which in a measure are to be considered as coated, as *e. g.* copying paper with the coat of color or tissues with transverse threads. Hard-rubber becomes so much impressed in rubbing as to prevent the production of longitudinal waves.

b.—NASO-PHARYNX.

1. Prof. JASTROW. Observations on the absence of the sense of smell. *The Amer. Journ. of Psych.*, April, 1892.

1. A student, æt. twenty-one, suffered from complete anosmia. His mother had lost the faculty of smelling at the time of pregnancy. Perceptions of taste and temperature and the sensibility were normal. It was confirmed by experiments, that many sensations which are usually attributed to the perception of taste are to be considered as sensations of smell. No difference was experienced in the taste of tea, coffee, and hot water. The patient had only the perception of sweetness of the different fruit syrups. In recognizing a series of other substances, viz., Aq. amygd. amar., ether, peppermint, mustard and pepper, the patient displays great uncertainty.

SECOND PART:—PATHOLOGY AND THERAPEUTICS OF THE
EAR AND NOSE

By ARTHUR HARTMANN, BERLIN.

GENERAL LITERATURE.

1. LOEWENBERG. Influenza otitis observed at Paris in the year 1891. (L'otite grippale observée à Paris en '91.) *Annal. des malad. de l'oreille*, etc., and *Trans. Amer. Otol. Society*, 1891.

2. LANNOIS. Ear complications in the course of leukæmia. (Complications auriculaires au cours de la leucocythémie.) *Annal. des malad. de l'oreille*, etc., 1892, No. 1.

3. SZENES, SIGM. Therapeutic results obtained from some new remedies for the ear. *Allgemeine Wiener med. Zeitschrift*, 1892, No. 18.

4. EITELBERG, A., Vienna. Otological communications. *Wiener med. Presse*, 1892, No. 6.

4 a. MAX, EMANUEL, Vienna. A novel treatment of otalgia tympanica. *Wiener med. Wochenschrift*, 1892, No. 31, et seq.

5. BALLAGE, JOH. Circumscribed cerebral softening after injury to the membrana tympani and the tympanic cavity. *Mi. Orvöse heilatp*, 1891, No. 46.

6. POLLAK, Vienna. The relations of the teeth to the ear. *Centralblatt f. d. ges. Therapie*, May, 1892.

7. MCBRIDE. Cysts of the tonsils, nose, larynx, and ear. *Brit. Med. Jour.*, May 14, 1892.

8. CHARAZAC, Toulouse. Contribution to the study of the malignant tumors of the ear. (Contribution à l'étude des tumeurs malignes de l'oreille.) *Revue de laryng., d'otol.*, etc., January, 1892.

1. LOEWENBERG reports that he has observed many cases of marked otitis media which had recovered after one administration of the air douche. In some instances this procedure was more frequently required, and in some cases of long duration the removal of adenoid vegetations led to a cure. Furthermore he describes two cases of chronic otorrhœa with kidney-shaped perforations of the membrana tympani, which did not recover completely. The recurrence of hemorrhagic myringitis was observed but in one case. BOK, Berlin.

1a. Among other peculiarities of the epidemic of influenza in 1891 in Paris, LOEWENBERG has noticed an absence of the hemorrhagic forms of otitis which were common in northern Europe during the same period. He has resorted to trephining of the mastoid much less frequently than his German confrères, and has succeeded in curing many cases which had all the symptoms of brain complication. Among the other specific features of the epidemic was an acute otitis cured often by a single inflation with a Politzer bag, and a suppurating otitis media with a peculiar form and course of tympanic perforation. The perforation is pyriform and its apex is towards the head of the malleus, the end of the handle lying in the larger parts of the opening.

SWAN M. BURNETT.

2. LANNOIS in this paper discusses the aural complications in the course of leucocythæmia founded on the observation of nine cases, one of which has not been heretofore published. He arrives at the following conclusions: Leucocythæmia may be associated with symptoms and disturbances of the ear. The observed phenomena consisted in uni- or bilateral deafness with or without subjective noises and vertigo, or in the appearance of a very marked and complete Ménière's disease. This difference of the symptoms is due to the fact that the lesions do not always attack the same portions of the hearing apparatus. They may affect the tympanum only (Gradenigo), the tympanic cavity and the labyrinth (Steinbrügge), or the labyrinth only (Poltzer,

Steinbrügge, Lannois). In four out of five cases the anatomical lesion was a hemorrhage. In one case (Politzer's), a genuine leukæmic neoplasm was found. These complications are quite rare, which is explained by the fact that they are found only in patients with more or less previous disturbances of the ear.

G. GELLÉ, Paris.

3. SZENES used cocaine and bromethyl against tinnitus without success. He has obtained satisfactory results in suppurations of the ear with aristol and dermatol. POLLAK, Vienna.

4. EITELBERG reports the following cases: 1. Amnesia following paracentesis of the membrana tympani. 2. Spontaneous absorption of a considerable serous exudation of the tympanic cavity. 3. Two cases of meningitis cerebro-spinalis without connection with an aural affection. POLLAK.

4a. MAX reports beneficial results from the use of Lucae's elastic pressure probe in the treatment of otalgia tympanica.

POLLAK.

5. The injury was produced by puncture with a pipe-tube, which penetrated the membrane below the handle of the malleus. Otorrhœa, hemiparesis of the lower and upper extremity rapidly set in. The patient died comatose a few days after the injury. The autopsy did not reveal any pus in the cells, the petrous bone, nor in the cavity of the skull, but a softened area in the island of Reil about the size of the head of a mouse. POLLAK.

6. Reprint from Scheff's *Text-book of Dentistry*, written for dentists. POLLAK energetically opposes the still prevailing wrong view of the etiological relation of the teeth to accidental affections of the ear during reactions.

7. MCBRIDE points out that true retention-cysts of the tonsils are of very rare occurrence. They are distinguished from mere collections of secretions by being covered by a layer of mucous membrane with a delicate vascular network upon its surface. The cysts contain a cream-like, odorless fluid. McBride reports two such cases. Cysts are much more common in the nose and in the larynx, especially in the latter situation. Small cysts in the external auditory meatus are of extreme rarity. One case is given in which the cyst was attached to the upper and anterior part of the osseous meatus and contained serous fluid.

8. CHARAZAC gives a brief historical synopsis of the literature upon malignant tumors of the ear. These are generally very

rare and occur almost invariably during the advanced ages. The malignant tumors are distinguished histologically as carcinomata and sarcomata, the latter being of much more frequent occurrence. The symptoms, prognosis, and treatment differ according to the seat (auricle, external meatus, middle and inner ear). The carcinomata of the middle ear are distinguished by intense hemorrhages, profuse otorrhœa, partly with necrosis, extreme deafness, and pain. They may extend to adjoining organs and thus produce the most varied complications, as facial paralysis, respiratory and nutritive disturbances, etc. The prognosis is absolutely unfavorable. The malignant tumors of the inner ear are always secondarily transmitted from the middle ear or the cerebrum. Primary carcinoma of the labyrinth has not been as yet positively determined as such. Fibro-sarcoma occurs most frequently upon the acoustic nerve, the main symptom being deafness. The other adjoining central nerves were subsequently implicated. These conditions are illustrated more fully by the author by nine histories of cases. BOK.

INSTRUMENTS AND METHODS OF EXAMINATION.]

9. DELSTANCHE. Presentation of instruments (Présentation d'instruments). *Réun. des laryng. belges in Liège*, 1892, June 5th.

10. KOEHLER, Posen. Furunculotome for the external auditory meatus. *Monatsschr. f. Ohrenheilk.*, etc., 1892, No. 3.

11. LAURENT (Trépano-ponction de l'antre pétreuse chez l'enfants.) Trephining of the petrous antrum in the infant. *Réunion de laryng. et d'otolog. belges in Liège*, 1892, June 5th.

12. CHOLEWA, Berlin. Instruments for the application of trichloride acetic acid in the nose and ear. *Monatsschr. f. Ohrenheilk.*, etc., 1892, No. 2.

13. SPEAR, E. D. A new aural forceps. *Trans. Amer. Otolog. Soc.*, 1891.

14. JACOBSON, L., Berlin. Some new apparatuses and instruments for galvano-cautery and electric illumination. *Berliner Klin. Wochenschrift*, 1892, No. 13.

15. POLITZER, A. Experiment with the tuning-fork for determining the patency of the Eustachian tube. *Wiener medicinische Wochenschrift*, 1892, No. 26.

16. KAYSER, R. Contribution to the technique of examination of bone-conduction. *Monatsschr. für Ohrenheilkunde*, etc., 1892, No. 3.

17. LANGE. Can the microphone be advantageously used for the construction of an apparatus for the improvement of hearing? *Deutsche med. Wochenschr.*, 1892, No. 15.

18. JANKAU, LUDWIG, Zurich. A new method of examination for differential diagnosis of affections of the labyrinth and middle ear. *Deutsche med. Wochenschr.*, 1892, No. 10.

19. KRZYWICKI, VON, Berlin. Contribution to the study of the differential diagnostic importance of the examination of the hearing function with the tuning-fork. *Berl. klin. Wochenschr.*, 1892, No. 12.

9. DELSTANCHE presents the following instruments: 1. Elastic catheter with metal mandrin. 2. Cotton holder for gradual enlargement of nostrils. 3. Obturator of the external meatus. 4. Instrument for removal of cristæ of nasal septum, scissors-like, one arm with indented, the other with cutting edge. 5. Modification of rarefactor. SCHIFFERS, Liège.

10. KOEHLER's furunculotome is bent at an angle and is furnished at the anterior end with a lancet-like spine directed downward. KILLIAN.

11. LAURENT uses for opening the mastoid process of children, an exploratory needle with double canula: the inner, being obliquely cut off, penetrates the bone; the outer serves as a drainage tube. SCHIFFERS.

12. CHOLEWA has furnished Hartmann's nasal and aural probes anteriorly with an ear, for the better attachment of the crystals of fused trichlor-acetic acid. KILLIAN.

13. SPEAR has devised a short, strong forceps body to which can be attached slender ring or serrated forceps or even a delicate pair of scissors. This secures strength and delicacy.

SWAN M. BURNETT.

14. JACOBSON ordered cheap and transportable storage batteries of well-known firm of W. A. Hirschmann (Berlin). He recommends for galvano-cautery and electroscope a primary battery, weighing 7 kilogrammes, at the price of about 17 dollars, sufficient for not too extensive use; laryngologists need a larger one. Jacobson has somewhat improved Dr. Kuttner's forehead lamp and has devised galvano-caustic burners, which are made aglow at the end only, an advantage over those used heretofore, principally in operations of the ear and larynx. RUMLER.

15. The tuning-fork C, = 512 vibration, placed when struck before the nostrils, was normally perceived much more intensely in

either ear during the act of deglutition. In unilateral middle ear affection with impermeability of the Eustachian tube the tuning-fork, when placed in front of the nostrils, is perceived in the normal ear, but the sound is intensified in the diseased ear after opening of the Eustachian tube. In unilateral affections of the middle ear with permeability of the tube the tuning-fork is perceived much more intensely in the diseased ear. In persistent perforations and cicatrices of the membrana tympani, the intensification of the sound of the tuning-fork may be objectively determined by combining the experiment with the act of deglutition. In unilateral affections of the labyrinth the tuning-fork held in front of the nostril is perceived under all circumstances only in the normal ear.

POLLAK.

16. The tuning-fork is placed in the centre of a wooden staff (sound-conducting staff), against the end plates of which the examining and the examined persons press their mastoid processes in such a manner as to hear simultaneously by bone-conduction. The error of unequally striking the tuning-fork in successive examinations of the normal and diseased ear is thus avoided, also the error of unequal pressure in repeated placings of the tuning-fork upon the bone, and finally the loss of time. The instrument is manufactured by Haertel at Breslau.

KILLIAN.

17. Spurred on by the prize offered by the Baron Léon de Leuval at Nice: "For the construction of the best and most portable apparatus made according to the principle of the microphone for the improvement of the hearing power of deaf persons," LANGE made careful and troublesome investigations with the result that the chosen principle of the microphone is *not* suitable for an apparatus for improving the hearing power. The author assures that the microphone—no matter upon what system it is constructed—is no intensifier of sound, as is wellnigh generally assumed, but only a transmitter, unable to impart a greater intensity to words, sounds, or noises.

NOLTENIUS, Bremen.

18. JANKAU's new method of examination consists in auscultation of the vibrating tuning-fork which is placed upon the skull.

19. KRZYWICKI's patient contracted concussion of the brain with aphasia and deafness in the right ear, by the falling of a board upon the region of the left temporal lobe. The sounds of the tuning-fork by bone-conduction from all regions of the head are heard in the right ear only.

EXTERNAL EAR.

20. HAUG, Munich. Perichondritis tuberculosa auriculæ. *v. Langenbeck's Archiv*, vol. 43.

21. LABRAND, Lille. A method of treating the cysts of the auricle (Sur un procédé de traitement des cystes du pavillon). *Revue mens. de laryng.*, etc., 1892, June.

22. CHOLEWA, Berlin. Further experience with menthol in otitis externa furunculosa and otitis media purulenta acuta. *Monatsschr. f. Ohrenheilk.*, etc., 1892, No. 3.

23. BARR, THOMAS. Aural exostosis removed with the electric snare. *British Med. Journ.*, 1892, July 2d.

24. JOHNSON, WALTER B. Abnormal living entozoa in the human ear. *Ophthalmic Record*, 1892, January and February.

25. HOUGHTON, HENRY C. The artificial membrana tympani considered as a splint or crutch. *Journ. of Ophth., Otol., and Laryng.*, January, 1892.

26. THEOBALD, SAMUEL. Some partially successful attempts to promote the healing of old perforations of the tympanic membrane. *Trans. Amer. Otol. Soc.*, 1892.

27. SHEILD, A. MARMADUKE. Removal of a mass of lead from the tympanic cavity by means of metallic mercury. *Lancet*, 1892, April 20th.

28 and 29. GOMPERZ, B. Contribution to the study of regeneration of the substantia propria in cicatrices of the membrana tympani. *Monatsschr. f. Ohrenheilk.*, etc., 1892, No. 4.

20. HAUG has observed four cases in tuberculous persons of perichondritis of the auricle, which are clinically distinguished (principally by offensive disintegration of the diseased tissue, by infiltration of the adjoining glands, and by the proneness to ulceration) from the ordinary forms and in which the diagnosis of tuberculosis was ascertained by the microscopical examination of detritus and of excised portions of tissue. The author believes that the tuberculosis was only local and produced by inoculation. The treatment consisted in extensive opening, in excision of implicated glands, and dressing with gauze imbued with peru balsam or with iodoform. The prognosis is favorable, although the auricle remains considerably disfigured. ZARNIKO, Berlin.

21. LABRAND agrees with Hartmann's view, that the aural cysts proper have nothing in common with othæmatomata. He

recommends for treatment the galvano-caustic puncture of the cyst and burning of its inner wall, thereby producing firm adhesion without the deformity, the cicatrix excepted. **BOK.**

22. **CHOLEWA**, in aural furuncles, introduces a ten per cent. solution of menthol oil, by means of cotton pellets, into the external meatus, and continues this treatment for a week. The pain is relieved on the first day, when the external meatus becomes swollen. Relapses fail to appear. Incisions are required in furuncles situated outside or close to the introitus auriculæ. Acute otitis media is at first treated with ten per cent. solutions of carbolyzed glycerine. Cholewa, in purulent exudation, performs the paracentesis after disinfecting the external auditory meatus with lysol, irrigates the tube and middle ear with solutions of table salt, blows into the middle ear a few drops of ten per cent. solution of menthol oil, and plugs the entire external auditory meatus with dry cotton impregnated with mentholized glycerine. This last is daily renewed, and antiseptic dressing placed over it. The suppuration is rapidly diminished under this treatment, swellings in the external meatus are reduced, and recovery takes place in about a week. Treatment with menthol is very successful, because it renders the staphylococcus pyogen. aureus (according to Roenik ?) and the streptococcus pyogen. (according to Roenik and Troie) incapable of development.

KILLIAN.

23. **BARR'S** patient was a female, aged twenty-four. A white, firm, rounded body was seen just inside the left meatus, attached apparently to the back wall of the canal at about the junction of the bone and cartilage. While firm, it had not the ivory hardness of many of the exostoses found in this position. The symptoms were such as to call for the removal of the tumor without delay, and the patient being anæsthetized, it was decided first to try the electric snare, which with some little difficulty was passed through the growth, and on turning on the current and exercising slight traction, the pedicle was severed. On examination, the tumor was found to consist of hard, dense bone with a thin layer of cartilage on the surface.

URBAN PRITCHARD, London.

24. **JOHNSON** reports a case of the grub of the meat fly found in an ear suffering from chronic otitis media purulenta.

SWAN M. BURNETT.

25. **HOUGHTON** believes that the cotton pellet, which he has

found superior to the rubber artificial drumhead, acts by the mechanical support it gives to the relaxed ossicles.

SWAN M. BURNETT.

26. After having tried unsuccessfully all the methods commonly used for healing old perforations of the membrana tympani, including the paper disc and cauterization of the edge of the perforation with nitrate of silver, THEOBALD has come to use simply a pledget of cotton anointed with vaseline, which is applied like an artificial membrane against the drum. He reports one case in which this succeeded after the other methods had failed.

SWAN M. BURNETT.

27. SHEILD'S case is unique and forms a valuable contribution to the subject of foreign bodies in the ear. A mass of molten lead accidentally fell into the ear of an old man seventy years of age, and every means attempted to dislodge it having failed, Sheild was contemplating detaching the auricle posteriorly and chiseling away the wall of the bony canal. Before performing this operation, however, it was determined to try the effects of subjecting the lead to the action of metallic mercury; this was accordingly done, the patient being kept on his side and his ear filled with mercury. This treatment was continued at intervals for, on the aggregate, sixteen hours, at the end of which time, the leaden mass, much reduced in size and corroded by the mercury, was easily removed with the syringe.

URBAN PRITCHARD, London.

28 and 29. GOMPERZ, at the microscopical examination of a completely newly formed membrana tympani, found the substantia propria with radiating fibres, but much denser than in the normal drumhead. He believes that these fibres had newly formed from the tympanic ring. In partial defects the new formation of the fibres of the membrana propria is rendered more difficult, to wit, in the centre of the membrana tympani and in the province of the light reflex, on account of the more unfavorable nutritive conditions due to the tension. Complete cicatrices of the membrana tympani were found, according to Gomperz, 20 times among 20,000 ear patients. These membranes resemble that of the tympanum in position, size, and color, present neither the handle nor the short process of the malleus, and are in some instances adherent to the promontory but frequently free and movable, yet thoroughly firm. Their curvature is in most cases of the shape of a cupola. They exhibit a tendency to dermatitides with the formation of cholesteatomatous plugs.

KILLIAN.

MIDDLE EAR.

30. SMITH, S. MACCUE. Traumatic hemorrhage of the tympanum causing deafness, with subsequent restoration of hearing. *Annals of Ophthalm. and Otology*, January, 1892.

31. DELSTANCHE. Intratympanal injections of liquid vaseline (injections intratympanales de vaseline liquide). *Réunion de laryngol. et d'otolog. belges à Liège*, 1892.

32. MARTHA. Notes on two cases of otitis media purulenta containing the bacillus pyocyaneus in pure cultures. (Notes sur deux cas d'otite moyenne purulente contenant le bacille pyocyanique à l'état de pureté.) *Arch. de méd. expér.*, January, 1892.

33. CRÉVOISIER DE VOMÉCOURT, LIONEL DE. Contribution to the study of the part played by micro-organisms in purulent middle otitis and its complications from the mastoid. (Contribution à l'étude du rôle des micro-organismes dans les otites moyennes purulentes et leurs complications mastoïdiennes.) 1892, Paris.

34. THEOBALD, SAMUEL. An unusual form of dislocation of the malleus handle. *Trans. Amer. Otol. Soc.*, 1892.

35. MAX, EMANUEL. Critical remarks on the application of sodium tetraboricum in chronic aural suppurations. *Internat. klin. Rundschau*, 1892, Nos. 2 and 3.

36. GARNAULT, M. Therapeutic application of the soluble salts of bismuth, principally in otorrhœa. (Sur l'application thérapeutique des sels solubles de bismuth en particulier dans les otorrhées.) *Soc. Paris. d'otolog.*, March, 1892.

37. GARRIGAU - DÉSARÈNES. Scraping of the malleus in chronic otorrhœa. (Du grattage du rocher dans l'otorrhée chronique.) *Revue mens. de laryngol.*, etc., 1892, No. 11.

38. ROHRER, ZURICH. Contribution to the pathology of cholesteatoma of the ear. (Contribution à la pathologie du cholestéatome de l'oreille.) *Ibid.*, No. 7.

39. WILSON, F. M. Three cases of acute suppurative otitis with complications and one death. *Trans. Amer. Otol. Soc.*, 1891.

40. BLAKE, CLARENCE J. Mastoid cases. *Trans. Amer. Otol. Soc.*, 1891.

41. BACON, GORHAM. Notes on the use of the Leiter coil in the early stage of mastoid disease. *Trans. Amer. Otol. Soc.*, 1891.

42. BELT, E. OLIVER. Suppuration of the middle ear complicated with abscess of the neck, with report of a case. *Ophthalm. Record*, May, 1892.

43. KNAPP, H. Two cases of acute mastoid inflammation, both operated on. In one otorrhœa and fatal meningitis. Death, as shown by the autopsy, preventable. In the other the drum-head unbroken; perfect recovery. *Trans. Amer. Otol. Soc.*, 1891.

44. RAY, J. M. Acute suppuration of the middle ear; meningitis; death. Autopsy. No involvement of the temporal bone. *Trans. Amer. Otol. Soc.*, 1891.

45. RANDALL. A case of suppuration, exostosis, and otitic epilepsy; mastoid trephining, followed by fatal septic meningitis. *Trans. Amer. Otol. Soc.*, 1891.

46. MILLIGAN, WILLIAM. The treatment of attic suppuration by excision of the membrana tympani and auditory ossicles. *Lancet*, 1892, January 16th.

47. REINHARD. Contribution to the malleo-incudal excision. *Arch. f. Ohrenheilk.*, vol. xxxiii., p. 94.

48. BURNETT, C. H. Excision of the membrana tympani and necrotic malleus in four cases of chronic suppurative otitis media. *Trans. Amer. Otol. Soc.*, 1891.

49. STACHE. Further communications upon the operative exposure of the cavities of the middle ear after ablation of the auricle. *Berl. klin. Wochenschr.*, 1892, No. 4.

50. PEPPER. Diseases of the temporal bone. *Lancet*, 1892, March 5th.

51. HASSETT VAN. Clinical contributions to the opening of the mastoid process. (Bydrage tot de Casuistick der operatieve opening van den Proc. mastoideus.) *Proefschr.*, Leyden, 1891.

52. GRUENING, E. Notes on operations on the mastoid process. *Trans. Amer. Otol. Soc.*, 1891.

53. MOLL. Trephining of the mastoid process (Trépanation de l'apophyse mastoïde.) *Réunion de laryng. et d'otol. belges à Liège*, 1892.

54. HOFFMANN, E., Greifswald. Persistence of open osseous cavities lined with epithelium after trephining the mastoid process. *Deutsche med. Wochenschr.*, 1892, No. 6.

55. HECKE, Breslau. Contribution to the cure of metastatic pyæmia in diseases of the middle ear. *Arch. f. Ohrenheilk.*, vol. xxxiii., p. 141.

56. DEAN, H. P. Cerebellar abscess successfully treated by operation. *Lancet*, 1892, July 30th.

57. HAUSBERG, Dortmund. Contribution to sinus thrombosis. *Monatsschr. f. Ohrenheilk.*, 1892, No. 1.

58. PARKER, RUSHTON, Liverpool. Two cases of pyæmia following suppuration of the middle ear, treated by ligature of the internal jugular vein and cleaning out the lateral sinus with complete success in one of the cases. *Lancet*, 1892, January.

59. HESSLER, Halle. Extradural abscesses following otitis. *Arch. f. Ohrenheilk.*, vol. xxxiii.

60. HECKE, Breslau. Extradural abscess in the course of otitis media. *Arch. f. Ohrenheilk.*, vol. xxxiii., p. 137.

60a. POLO, Nantes. Trepanation of the skull and the mastoid process, in consequence of otitis media purulenta (trépanation du crane et de l'apophyse mastoïde suite d'une otite suppurée). *Revue mens. de laryng., d'otologie, etc.*, 1892, No. 2.

30. In the two cases which SMITH reports there was hemorrhage filling the tympanic cavity. In the first case there was tinnitus, vertigo, and the usual symptoms of Ménière's disease and a year after the accident the mastoid was trephined but without effect. The general morale of the patient was very bad. Two years after the accident, Smith made a free opening into the drum-head and washed out the blood clot with complete relief to all the distressing symptoms. The patient now hears perfectly. The other case was of the same nature, but less severe, and the result of evacuation of the blood equally happy. SWAN M. BURNETT.

31. DELSTANCHE confirms his former communications concerning the use of pure or iodoformized fluid vaseline in chronic affections of the middle ear, and now uses this treatment also in acute painful middle-ear affections with exudations. In several instances the exudation was absorbed, in other cases the pain was relieved by the remedy, principally in influenza otitis.

SCHIFFERS.

32. MARTHA points out that the bacillus pyocyaneus seems to play a certain part in man, as follows from some observations, referring to the so-called pyocyaneous infection reported by Ehlers and Neumann (*Soc. biolog.*, 1890) and by Oettinger (*Sémaine médicale*, 1890, p. 38). These cases taken from human pathology, resemble to a certain extent the pyocyaneous infection, artificially produced in animals, principally in hares (according to Charrin). In addition, he reports two cases of otitis media, in which the bacillus pyocyaneus was found in pure cultures in the pus discharged from the tympanum. In fifty-one other cases of suppuration of the middle ear the presence of the bacillus pyo-

cyaneus could not be determined in the examined pus. Experiments to produce suppuration in the tympanum by means of pure cultures have not been successful. One of the patients was apparently tuberculous. The second did not present any signs of tuberculosis, but the pyocyaneous origin of his otitis media appears to be well established. GELLÉ.

33. LIONEL DE CRÉVOISIER DE VOMÉCOURT has written a full and elaborate paper on micro-organisms occurring in purulent inflammations of the middle ear and the mastoid process with special reference to acute infectious diseases. The most frequent bacterial species are : streptococcus, pneumococcus, Friedländer's bacillus, staphylococcus, and bacillus pyocyaneus. They may appear singly or combined. Streptococcus and pneumococcus play the most important part and produce the severest symptoms. In some acute infectious diseases the subsequent otitides take an especial clinical course, corresponding with the nature of their bacillus. In inflammations of the mastoid process the streptococcus has been found almost exclusively. The infection may develop from the external meatus, or the Eustachian tube, particularly from the circulatory or lymph system. With reference to the treatment, the author assigns a very prominent part to antiseptic and surgical procedures. BOK.

34. THEOBALD reports a case in which, in a patient affected with destruction of the posterior half of the membrana tympani, the handle of the malleus was completely separated from the head of the bone, remaining attached to the membrana tympani at its tip, the other end curving forwards and outwards into the auditory canal, the free end lying nearly in contact with the anterior wall of the meatus. It was not disturbed.

SWAN M. BURNETT.

35. MAX does not confirm Kasemann's praise of the extraordinary action of sodium tetraboricum, which, in its limited province, can be employed only where boric acid cannot be used as a powder on account of its difficult solubility.

36. The salts of bismuth have the advantage of not preventing the reaction of the soluble ferments. These substances appear according to GARNAULT to be much more efficacious than the ordinary antiseptics : acidum boricum, resorcine, creoline, argentum nitricum, etc. The salt of bismuth is an iodine compound with bismuth and potassium, of which five to six lukewarm drops (after preceding injections of water) are instilled into

the ear in a ten per cent. solution, to which a small amount of glycerine is added. If there be a painful reaction the solution may be diluted with $\frac{1}{2}$ part of water. GELLÉ.

37. GARRIGAU DÉSARÈNES recommends Meyer's procedure of scraping off the tympanic walls with a small curette, if the usual methods are without avail. If the mastoid cells are implicated, the mastoid process should be opened. The author mentions a few cases cured in this manner. GELLÉ.

38. ROHRER collates twelve cases of cholesteatoma of the ear. The cholesteatoma had developed in five cases apparently as a tumor of the external meatus, and also in four cases in the tympanum. In two cases a pseudoplasm, consisting of epidermal lamellæ, had formed in an accessory cavity of the tympanum and in the mastoid process. In one case a genuine cyst was found. In all cases this formation had followed an inflammation with subsequent profuse epidermal desquamation and proliferation. BOK.

39. In the one fatal case of WILSON death was caused by cerebral abscess. The chief point of interest about the other two is that they were benefited or cured by going to Florida, and had relapses on return to a northern climate.

SWAN M. BURNETT.

40. During the last year BLAKE has seen 30 mastoid cases, 23 of which came to operation. The clinical history of each case is given in full. Of the operated cases 1 healed in 6 days, 1 in 7, 1 in 9, 1 in 11, and 3 in 13 days. There was one fatal case. All the operations were done under ether and the strictest antiseptic precautions. SWAN M. BURNETT.

41. BACON has not had an extensive experience with the use of cold by the Leiter coil in beginning mastoid inflammation, but in all the cases in which he has used it it has been very satisfactory. SWAN M. BURNETT.

42. In BELT's case a man of fifty-three years, who drank hard, was taken with the grippe, attended with acute otitis media purulenta with perforation of the drum. Six weeks later there was still discharge and slight swelling about the ear, and in a few days after there was a swelling along the cleido-mastoid muscle about two inches below the auricle. Temperature and pulse normal, and continued so to the end. Mastoid not red, swollen, or tender. The abscess in the neck was finally opened, and when the incision was made pus welled up into the meatus. The periosteum

of the mastoid was healthy, and the mastoid itself when opened was found to be normal. The patient died in a few days from exhaustion apparently. No autopsy was obtained.

SWAN M. BURNETT.

43. KNAPP'S cases were as follows: Case 1. A man of twenty-six had had painful inflammations in left ear for 4 weeks before first seen, headache, some nausea, and especially giddiness and stupor. Intellect clear; discharge irregular but purulent. Temperature normal. Three days after, the mastoid being tender and swollen, the bone was chiselled, but no pus found. On the fifth day after, there was free discharge of pus from the wound, but his temperature was 100° . Twenty-three days after the opening of the mastoid he died comatose after convulsions. On autopsy a small abscess was found in the foramen lacerum posterius—and this could have been easily reached had the chiselling been extended 3 or 5 millimetres farther.

Case 2. A man of fifty-one years had acute mastoiditis interna with the membrana tympani unbroken, but red and bulging. There was headache and dizziness. The mastoid was swollen and tender. The bone was laid bare and an oblong cavity chiselled into it. The outer cortex was compact and very vascular and there was a certain number of small polypoid excrescences or granulation tissue in the air spaces. The patient lost his pain from the moment of the operation and the case ended in perfect and permanent recovery.

SWAN M. BURNETT.

44. RAY'S case was a woman of forty-seven who had a typical otitis suppurativa acuta of the right ear which ended in death in ten days. On autopsy the mastoid was found to be healthy and the roof of the tympanum intact. The pia was opaque and the sulci filled with greenish pus. The meningitis was most apparent over the convexity of the anterior lobes.

SWAN M. BURNETT.

45. RANDALL'S case was an alcoholic of thirty years, who had had an incessant otorrhœa from the left ear, caused by scarlatina since childhood. Hearing was practically lost. Recently there were epileptic attacks beginning with aura in that ear. There was an exostosis of the meatus and a collection of cholesteatoma was suspected and the mastoid trephined, but nothing abnormal was found. Good communication with the antrum and throat was established. Fifteen days later, symptoms which proved to be those of pyæmia set in and the patient died. Autopsy revealed a meningitis which could not be connected with the ear trouble and which was prob-

ably due to absorption from the wounded bone. The epilepsy he thinks was reflex, due to a localized carious inflammation in the tympanum. Short notes of other similar cases are given.

SWAN M. BURNETT.

46. After an elaborate summary of the literature of the subjects, Milligan cites four cases in which he had himself adopted this procedure, and in all of these there was improvement.

URBAN PRITCHARD, London.

47. REINHARD recommends the excision of malleus and incus for the cure of chronic suppuration of the attic, without consideration of the still existing hearing power. The affection of the head of the malleus may be diagnosed from the quality of the secretions, exhibiting the signs of bone suppurations and retention of pus, and above all from its discharge from a tiny, high situated fistula. The diagnosis is strengthened by the picture of the drum-membrane, corresponding with that of malleus caries given by Politzer with extensive or total defect of the membrana tympani. Furthermore, the perforation of the membrana flaccida, frequently very small, with otherwise intact membrana tympani, is characteristic of the affection. Repeated proliferations of granulations at the place of perforation insure the diagnosis of caries of the head of the malleus. There may also be found a *newly formed* drum-membrane, which has formed after the suppuration in the tympanum has come to a standstill. "This membrane is distinguished from the original by the absence of light conus, by anomalies of tension, and by a peculiar gloss; in most cases the handle of the malleus is missing, not unfrequently appearing as a white band running from the barely visible short process downwards." With reference to the treatment Reinhard says that "even the most careful treatment of suppurations of the attic is without avail, unless the narrow passages for the efflux of pus from the upper part of the tympanum are enlarged and all diseased portions of bone are removed as well as possible." Reinhard has performed the excision of the malleus in 30 cases, in 7 of which the mastoid affection was present. In the remaining 23 cases, in 16 of which the incus was also removed, 15 recovered, viz., the ear remained dry during at least six months. The patients remained in bed 1 to 2 days only. In the first week irrigations were made with 2 to 3 per cent. solutions of carbolic acid or with sublimate of $\frac{1}{2}$ -1 : 1,000; the ears were dried and dressed with iodoform gauze. Vertiginous attacks, facial paralysis or other

accidents have not been observed after the operation of the 30 cases. In the majority of cases cicatrization of the wound took place after 8 to 21 days ; if the suppuration did not discontinue, irrigations were made with Schwartz's small antrum tube. The frequent headaches associated with suppurations of the attic disappeared after the operation if no other complications were present. Reinhard considers Schwartz's method when compared with Stacke's, "as the simpler, less complicated, less serious, and much milder measure." "The 15 recoveries among 23 cases encourage me to *continue* the performance of malleo-incudal excision in all cases of chronic suppurations of the middle ear with probable caries of the first two ossicles and affection of the attic *without* mastoid complications (viz., also without fistulæ in the posterior-upper wall of the external auditory meatus and without bulging of the latter." If after a long period it is impossible to cure the case in this manner or in disease of the mastoid process, Stacke's operation may be performed in addition to Schwartz's typical chiselling.

48. In all of BURNETT's cases the usual routine treatment for chronic suppurative tympanic disease had been tried before operation was resorted to. All the operations were done under ether and the illumination was by means of the electric head lamp. In the first case the suppuration was checked in nine months ; the hearing was not impaired. In the second the hearing was improved, but the discharge has not been checked. In the third case attic suppuration and cholesteatomatous collections were checked at once and there has been no return. Hearing improved from 0 to 2 feet. On the fourth case discharge was checked in two months and hearing advanced from 18 inches to 6 or 8 feet.

SWAN M. BURNETT.

49. "The idea of extensive exposure of the attic by chiselling off its outer and lower wall in incurable suppurations of the upper cavities of the tympanum, was originated from the unsatisfactory or rather isolated results reached by the mere removal of malleus and incus." In order not to operate in the dark, the auricle was ablated and the auditory meatus transversely severed ; thus it was possible to follow the suppuration from the membrana tympani into the cavities situated above the external meatus. STACKE originally confined himself to the exposure of the attic, then replaced the meatus in its former position and had the satisfaction of closing the external incision per primam and also

to reunite the meatus without stenosis. He soon discovered, however, that the suppuration was rarely confined to the tympanum only. He succeeded almost invariably (29 times out of 30 cases), during the operation, in recognizing or excluding the participation of the mastoid antrum in the suppurative process by means of the probe. "Stacke then, during the same narcosis, extensively opened the antrum and its aditus. He convinced himself in more than 30 cases that one should always succeed, by this typical operation, in opening all accessory cavities of the tympanum safely and without danger. Stacke reached the following results: 19 of 33 cases recovered, 2 improved cases underwent other after-treatment, 2 stayed away, 9 remained under treatment and 1 died from diabetes mellitus, not recognized before operation." The average duration of treatment lasts four months. The hearing power was in most cases somewhat improved, generally not essentially altered, but never impaired.

RUMLER.

50. PEPPER'S paper is a very good summary of the causes and effects of disease of the middle ear and of the adjacent structures. He considers that suppuration of the mastoid cells is one of the most common of preventable deaths, and that so long as a perforation of the tympanic membrane remains with discharge, however slight, there is an abiding cause of possibly fatal issue. In discussing the complications of chronic mastoiditis, allusion is made to the occurrence of facial paralysis, deep suppuration in the neck, recurrent external mastoid abscesses, necrosis of the posterior wall of the meatus, implication of the posterior wall of the meatus, implication of the temporo-maxillary joint, and sclerosing otitis of the mastoid bone. Interesting cases are cited to illustrate these points.

URBAN PRITCHARD, London.

51. Symptoms of cerebral abscess or meningitis are counter indications to the opening of the mastoid process. The affection was primary only in one case in consequence of tuberculosis, 11 chisellings were made after otitis media acuta, 12 after otitis media chronica. Nine operations were performed on account of osteomyelitis acuta, whilst in 14 cases the operation was indicated by chronic inflammation with caries of the mastoid process. In 14 cases abscesses had developed upon the process and in 4 cases the abscess had opened spontaneously. Recovery took place in 23 cases. Two deaths, one of which with meningitis from perforation of the empyema into the middle cerebral fossa,

another with pyæmia, which had developed before the operation, but had been operated upon against the author's principles.

POSTHUMUS MEYJÈS.

52. In three years GRUENING has operated forty-seven times on the mastoid. Thirty-nine of these cases were for acute caries or empyema of the mastoid with profuse purulent discharge through the middle ear. In two cases the cortex of the mastoid was intact without purulent discharge through the middle ear. In three cases there was chronic otitis media purulenta with cholesterine masses in the antrum and tympanic cavity. There was chronic otitis media purulenta with sclerosis of mastoid cells, thrombosis of the lateral sinus, and pyæmia in two cases, and chronic otitis media purulenta with sclerosis of the mastoid and abscess of the brain in one case. Gruening modifies Schwartze's operation by removing the whole of the external wall of the mastoid process. The cavity is then packed with iodoform gauze and a bandage applied. Neither the ear nor the wound is syringed. Even large incisions over the mastoid may be closed immediately after the operation. Forty of the cases remained aseptic during the time of healing, which averaged about four weeks.

SWAN M. BURNETT.

53. MOLL, in a case of influenza otitis, was compelled to chisel both mastoid processes.

SCHIFFERS.

54. HOFFMANN has observed in three cases among about fifty openings of the mastoid process, fistular formations behind the ear. There also existed at the bottom a wide communication between the external auditory meatus, or rather the middle ear, and the cavity of the mastoid process. Through this opening the epithelium of the external meatus or middle ear has immigrated into the mastoid antrum, and thus prevented the osseous wound from filling up with granulations and cicatricial tissue. The author, moreover, believes that no communication ought to be made between osseous wound and middle ear or external meatus through the operation, since the healing process is thus retarded.

NOLTENIUS.

55. HECKE successfully operated two patients with severe pyæmia. Case 1.—Pupil, aged seventeen. On the day subsequent to the removal of a polypoid granulation of the tympanic mucous membrane, chills, high temperature, and sensitiveness to pressure upon the mastoid process developed. On chiselling with an extensive opening of the antrum the fever abated. On the

fourth day after operation pleurisy of the left side set in, followed after a few days by purulent inflammation of the left sterno-clavicular joint, and then by pleuritis dextra and inflammation of the right shoulder-joint. "After twelve weeks complete recovery took place with excellent hearing power; watch, $\frac{1}{2}$ metre, and for whispered numbers, 6-7 metres." Case 2.—Merchant, æt. eighteen, occasionally catheterized for catarrh of the right tympanic cavity, was suddenly attacked by severe suppuration of the right ear. After five days high fever and chills set in, and the mastoid process became sensitive on pressure. The cortex was found on chiselling to be hardly altered, but the cells imbued with pus. The fever abated. After a few days chills reappeared, swelling and cutaneous reaction of the right elbow-joint, which discharged on opening a serous turbid fluid containing the streptococcus pyogenes. Recovery took place after four months. Hearing power restored to that before operation. Hecke found two weeks after opening of the elbow-joint, in the suppurations from the opening in the mastoid process, still the streptococcus pyogenes and the staphylococcus pyogenes albus, the patient being without temperature. RUMLER.

56. DEAN'S patient was a female, aged fourteen, with a history of left otitis media for five years and symptoms of cerebral disturbance for three weeks. No relief following the free opening of the mastoid cells by means of a single skin incision behind the ear, the soft parts were reflected and a trephine applied one inch behind and half an inch above the centre of the opening of the external meatus. The dura mater being then opened, the cerebrum was punctured in half a dozen different directions, reaching so far inwards as to tap the ventricles, but no pus escaped. The trephine opening was then enlarged in a direction downwards and backwards, the lateral sinus exposed and explored, and finally the cerebellum, and in this last situation the seat of the collection of pus was tapped, and upwards of an ounce escaped. The patient subsequently made a good recovery. Dean points out that, if the proper position is chosen, *i. e.*, just over the lateral sinus, it is possible at one sitting to explore not only the sinus itself, but also the parts below as well as those above the tentorium.

URBAN PRITCHARD, London.

57. A patient, aged sixteen, who had suffered for years from diarrhoea, was seized with inflammatory symptoms from the left ear, vomiting, chills, delirium, and somnolence. Swelling and

pain were missing from the mastoid, but the latter existed in the retromaxillary region. In chiselling of the mastoid process and laying bare the attic after removal of the posterior wall of the external osseous meatus, a sclerosed spot, three *mm* wide, was found upwards and backwards in the bone, after the removal of which with the chisel profuse purulent fluid escaped under strong pulsations. It emanated from the transverse sinus, which was therefore extensively exposed and principally laid bare inferiorly by the chisel. In spite of the favorable course taken in the beginning, the patient died on the 56th day from pyæmic processes of the pleura, peritoneum, and left shoulder-joint. The autopsy, which was confined to the head, revealed complete thrombosis of the transverse and superior petrosal sinuses. The wall of the superior longitudinal sinus was much thickened. At the place of suppuration of the thrombus of the transverse sinus a basin had formed in the dura mater and rarefaction had taken place in the occiput. The presence of a sequestrum, 6 *mm* wide, in the roof of the antrum, without corresponding affection of the dura at this place, is worthy of note.

The thrombosis of the transverse sinus just reaching the jugular foramen, no swelling of the internal jugular vein could be felt in the neck.

HAUSBERG recommends an earliest possible operation, which has to begin with chiselling the mastoid process. KILLIAN.

58. PARKER's patient, aged twenty-five, with offensive otorrhœa, was seized with pain and chills, vomiting, vertigo, occasional delirium. Furthermore bilateral neuritis optica, swelling and increased sensibility in the neck below the mastoid process developed. The symptoms persisted and increased, so as to necessitate the exposure of the jugular vein and mastoid process. The vein was found to be obstructed, was doubly ligated and excised. The mastoid process was filled with offensive pus, the sinus exposed. The vein was irrigated, but the sinus was plugged since blood escaped when opened.

In another case the sinus was also opened, but meningitis rapidly set in, to which the patient succumbed.

59. HESSLER has collected from literature 50 cases of genuine extradural abscesses, principally to ascertain : where is the most frequent seat, and what anatomical changes are found in the temporal bone, which have preceded the subdural abscess and have favored its development? Hessler has observed three cases.

"The extradural abscesses are of the same frequency in either ear, in the male more than twice as frequent as in the female, and principally from the first to the twenty-first year of age." Those cases in which the inflammation had been transmitted from the cavities of the middle ear to the bone and upward below the dura mater, are called by Hessler secondary extradural abscesses, in contra-distinction to the primary, in which no fistular communications existed between the cavities of the middle ear and the abscesses.

Among 53 cases 41 were secondary and 12 primary.

"With reference to the seat of the extradural abscesses, the carious fistula of the bone was found as follows :

"25 times upon the posterior surface of the petrous bone ;

"6 times upon the tegmen tympani ;

"1 each upon the anterior and upon the anterior and posterior wall ;

and in 8 cases the seat could not be recognized from the description."

The extent of caries of the petrous bone differed widely.

In 14 cases of secondary extradural abscesses recovery took place by operation, and in the 27 remaining cases death ensued, *i. e.* :

6 times from cerebral abscess ;

4 times from meningitis ;

3 times from cerebral abscess and sinusphlebitis ;

twice each from empyema of the pleura and sinusphlebitis with metastases ;

once each from meningitis with metastases, tuberculosis, cerebral œdema, dysentery ;

and in 6 cases the cause could not be recognized from the description.

In addition to the 10 cases of primary abscess from literature, Hessler reports two cases of his own observation.

In both cases recovery took place after operation.

Among the 12 abscesses were :

6 upon the posterior surface of the petrous bone ;

2 upon the interior surface of the petrous bone ;

1 upon the tegmen tympani, and in

3 the seat was not obvious from the description.

In 3 cases recovery took place after operation.

Extradural abscess may develop in a threefold manner. The

suppuration of the middle ear is most frequently transmitted through the bone to the dura covering it.

Other abscesses are undoubtedly of periphlebitic origin. In the third series of cases the extradural abscess develops simultaneously with the suppuration in the middle ear, as the subperiosteal abscess in acute infectious otitis or osteomyelitis; Hessler ranks his two observations among the latter class.

Hessler could not uniformly depict the appearance of extradural abscess, neither could he safely establish the indications for its diagnosis, which can be only per exclusionem from general purulent meningitis, sinus phlebitis, and cerebral abscess.

The treatment is prophylactic, by preventing retention of pus in the ear; and surgical, by extensive opening of the abscess, disinfection, and drainage.

RUMLER.

60. HECKE, at the time of the influenza epidemic of 1890, observed two cases with extensive collection of pus between bone and dura mater. Case 1: man, æt. thirty-three, was attacked in January by influenza and recovered after two weeks. In March headache in the right side, diminished hearing power. On May 9th: Sleeplessness for three weeks on account of right otalgia and headache. During the operation considerable amount of pus escaped from the fluctuating tumor situated behind the ear. No fistula being found in the mastoid process, the latter, of ivory hardness, was typically chiselled, $2\frac{1}{2}$ cm deep without opening the antrum. A tiny opening, situated $1\frac{1}{2}$ cm upward and somewhat backward from the porus acusticus externus, is found, through which pus escapes from the cerebral cavity, and is enlarged $1\frac{1}{2}$ cm in diameter. After three days the opening was enlarged principally backward on account of retention of pus. On the sixth day after the first operation death ensued from meningitis.

The autopsy revealed no particular changes in the tympanum; in the antrum, which was occluded from the tympanum, circumscribed caries, of the size of a lentil, was found with granulations. The above-mentioned fistula led from the antrum through the tegmen tympani into the cerebral cavity.

Case 2: Man, aged fifty-two, was attacked toward the end of May with influenza, followed by hardness of hearing and pain in the right ear. On August 12th abscess behind the ear was opened. In the fossa temporalis, about $1\frac{1}{2}$ cm above the porus acusticus externus, the dura mater was laid bare, on account of caries necrotica, to the extent of 2 cm in length and $\frac{1}{2}$ cm in width. The

mastoid process, being carious only in the cortical plate, but sclerotic in the inner, was chiselled $2\frac{1}{2}$ cm. Paracentesis of the membrana tympani resulted in the discharge of slight mucous exudation. Recovery without fever. Towards the middle of October the patient was about to be discharged with superficially granulating surface of the wound, when he suddenly was affected with the symptoms of meningitis and died on the following day.

The autopsy revealed extensive purulent meningitis and considerable gathering of pus between dura mater and bone in the middle and posterior cerebral fossa. . RUMLER.

60a. POLO describes a case in which severe cerebral symptoms had appeared in consequence of otitis media purulenta. The diagnosis of cerebral abscess was made. The treatment consisted in trepanation of the mastoid process, and the skull in the region of the temporal lobe. In puncturing the temporo-sphenoidal lobe a small amount of pus was discharged. The symptoms did not disappear after the operation, and the patient died on the following day. BOK.

NERVOUS APPARATUS.

61. HABERMANN, Graz. Diseases of the ear due to tabes. *Arch. f. Ohrenheilk.*, vol. xxxiii., p. 105.

62. ROHRER, Zurich. Torpor nervi acustici produced by salpingo-stenosis (Torpor nervi acustici produit par salpingo-stenosis). *Archivos Internat. de Rinologia, Laringol., Otol.*

63. GELLÉ. The aural sign in cerebral affections. (Le signe otique dans les maladies cérébrales.) *Annal. des mal. de l'oreille*, etc., 1892, May.

64. CHARAZAC, Toulouse. Some considerations of otitis interna syphilitica. *Revue de laryng.*, etc., 1892, No. 12.

65. TURNBULL, LAWRENCE. Deafness the result of the poison of syphilis. Its treatment by muriate of pilocarpine. *Annals of Ophthalm. and Otolog.*, 1892, January.

66. COHNSTÄDT, C. Contribution to the tuberculosis of the labyrinth. *Monatsschr. f. Ohrenheilk.*, etc., 1892, No. 5.

67. MILLS, C. K. The centre of hearing. *Brain*, January, 1892.

61. HABERMANN had the opportunity of examining a case of affection of the acoustic nerve in consequence of tabes clinically and pathologico-anatomically. We emphasize from the history of

the case the following points : Cook, æt. fifty-two, of sound constitution, was attacked 13 years ago with stinging pains in the left ear, rapidly followed by tinnitus, first in the right, then in the left ear. After a year complete deafness was suddenly noticed, which became permanent. Vertigo was not experienced, but later on signs of tabes. Shortly before death Habermann examined both ears of the patient and found bilateral complete deafness for the watch and voice. Low sounds of the tuning-fork (C) are still heard and repeated singing, but not the high notes.

At the autopsy both nn. acustici were found extremely altered, in as much as they appeared much thinner and of gray color. The microscopical examination of the cerebrum had the following result : Transverse sections of the pons and medulla oblongata made through the main nuclei of the acoustic nerves revealed these main and also the accessory nuclei to be intact, but the lateral and median acoustic roots extremely atrophied. The ascending acoustic roots were not altered. In the acoustic apparatus the following changes were found : The left middle ear was completely normal, the right showed acute inflammation, developed during the last weeks of the patient's life and having no causal connection with her deafness. Bilateral wellnigh complete atrophy of the nerve fibres of the ramus cochleæ, except a few fibres of the left side, with which an almost complete absence of nerve fibres of the cochlea corresponded. The ramus vestibuli was degenerated to a lesser extent. The same changes took place in the right ear, but not to such an extent. In the apex of the cochlea a bundle of nerve fibres was preserved and in the end portion of the basal turn a few ganglionic cells. The degeneration of the nerves must be brought in causal relation with the tabes : first, because there was no other cause for the atrophy of the nerves ; then, because the histological alteration corresponded with that observed in other nerves affected in tabes. At the conclusion, Habermann points out : " That, with the existence of hearing for low notes in otherwise complete deafness, the apex of the right cochlea contained a bundle of nerves although in degeneration, nevertheless still well preserved, in addition to completely preserved Corti's organs. This case, therefore, provided the patient's statements were correct, forms a new link in the chain of evidences for the support of the correctness of Helmholtz's theory of the function of the cochlea." Finally, with reference to the function of the two sacculi, we should take into consideration that, in spite

of the wellnigh complete deafness of the patient, a large portion of the nerves were still preserved in the sacculi and also in the ramus vestibularis. RUMLER.

62. ROHRER describes a case of torpor nervi acustici in consequence of stenosis of the Eustachian tube, which recovered rapidly after treatment with inflation of air through the catheter. The diagnosis was supported by the following points: (1) severe deafness; (2) almost complete absence of bone-conduction; (3) localization of Weber's experiment in the ear with lesser deafness; (4) positive result of Rinne's experiment; (5) mobility of the membrana tympani and ossicles; (6) normal hearing for high notes (somewhat diminished in the more affected ear); (7) success of treatment. GELLÉ.

63. GELLÉ has been induced by the symptoms of pachymeningitis corticalis to transfer the origin of the binauricular reflex of accommodation to the cervical medulla. He has since had two opportunities of observing analogous facts. One of his pupils has based a paper upon a case in which the phenomena of synergy were missing, although the organs and their functions were perfectly intact. GELLÉ.

64. Syphilis extends in most cases to the ear from the Eustachian tubes, upon which mucous patches or gummous ulcers develop from the naso-pharynx. Syphilis of the labyrinth and the acoustic nerve may develop at the different stages without affecting other parts of the hearing apparatus, or it may be transmitted from the middle ear. Rapid development, in some instances in the course of several months, in others in a few days or even suddenly, is characteristic of syphilis of the inner ear. It is associated with deafness, appearing gradually or suddenly, remaining stationary for some time and becoming suddenly worse. In addition very violent headaches at times lessening in intensity and loud aural noises and vertiginous attacks are experienced. Ocular symptoms and facial paralysis (transmitted from the acoustic nerve) are also observed. At the conclusion the author propounds the hypothesis, that in syphilis cerebral affections are more to be dreaded, and occur more frequently, when the primary infection has appeared in the throat, the tonsils, the lip, or the palate. BOK.

65. TURNBULL adds the weight of his experience to the value of hypodermatic injections of pilocarpine in cases of labyrinthine disease from syphilis. SWAN M. BURNETT.

66. COHNSTÄDT's patient, a girl, æt. eleven, with otorrhœa of four years' standing, in whom during the last two years incisions into the swollen mastoid process were twice made, was attacked by an acute inflammatory process. The middle ear was filled with granulations; the discharge offensive and contained tubercle bacilli. There existed facial paresis without swelling of the mastoid process. The latter was chiselled off and also the posterior, completely carious wall of the external osseous meatus. The course of the affection was favorable in the beginning, but death ensued after two weeks. At the autopsy the tegmen tympani was found to be carious, and upon the labyrinthine wall of the tympanum a large carious defect, from which caseous suppuration extended over the entire pyramid of the petrous bone. The cochlea and ampullæ were replaced by bands of connective tissue. The facial canal was eroded by caries. There existed in addition purulent basal meningitis and a cerebellar abscess of the size of a walnut.

Cohnstädt has frequently found tubercle bacilli in suppuration from the tympanum in scrofulous individuals, and had observed early implication of the mastoid process, before it was pointed out by swelling and pain upon pressure. One ought not to delay chiselling such cases. KILLIAN.

67. MILLS gives a most careful and elaborate account of the clinical symptoms and post-mortem appearances of a case that had come under his notice, and he concludes therefrom, *inter alia*, that the centre for word-hearing is situated in the posterior third of the first and second temporal convolutions, and that destruction of the centre on both sides is necessary in order to abolish hearing entirely. URBAN PRITCHARD.

NOSE AND NASO-PHARYNX.

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84. HALBEIS, I., Salzburg. Adenoid vegetations of the nasopharynx. Munich, 1891.

85. ALBESPY, DANIEL. Adenoid tumor and hypertrophy of the turbinated bodies, causing cerebral stasis of circulation and conjunctival catarrh, without aural disturbances. *Revue mens. de laryngologie*, etc., 1892, No. 1.

86. WROBLEWSKI, L. Contribution to the study of adenoid vegetations. The vegetations in the deaf-mute. *Ibid.*, 1892, No. 9.

87. LAVRAND, Lille. Adenoid tumors. Two successive relapses in one case, and one relapse in another case. *Ibid.*, 1892, No. 11.

88. WAGNIER, Lille. Treatment of naso-pharyngeal fibromyxomata. *Ibid.*, 1892, No. 12.

89. MEYJES, POSTHUMUS W. Anatomical changes in the ethmoidal conchæ. *Nederl. Tydschr. voor Geneeskunde*, vol. xxvii., No. 13.

90. GERBER. Syphilis of the naso-pharynx. *Arch. of Dermatol. and Syphilis*.

91. LUBET-BARBON. Note on the treatment of Tornwaldt's disease. *Revue mensuelle de laryngologie*, etc., 1892, No. 5.

92. CAPART. The employment of electrolysis in naso-pharyngeal fibromata. *Réunion des laryngolog. belges*.

93. MOURE, I. Treatment of hypertrophy of tonsils.

94. ARBUTHNOT LANE. Hemorrhage following tonsillotomy. *Brit. Med. Jour.*, 1892, June 24th.

68. SCHMIDT is justified in pointing out that the unpleasant inspiratory sucking in of the alæ nasi is at times so distressing as to make the result of rhino-surgical procedures, although successfully carried out, quite illusory. Feldbausch, at the author's suggestion, has constructed a small instrument, which may be worn continually without disturbance, and which answers its purpose. It pushes both alæ nasi apart without touching the septum, and is thus well borne. NOLTENIUS.

69. In a Malay, aged fifty, a hard tumor gradually developed upon the nose, hanging after four years beyond the upper lip, to the great annoyance of the patient during meals. In the operation without narcosis the knife followed as well as possible the original form of the nose. Complete recovery took place after six weeks, and the nose became almost normal. The microscopic examination revealed hypertrophy of the cutis with newly formed blood-vessels and hypertrophy of the sebaceous glands. POSTHUMUS MEYJES.

70. ROHRER's patient, from whom a rhinolith of the size of a hazel-nut was removed, suffered from permanent pains in the ear, and neuralgia of the fifth nerve over the entire side of the head, wry neck, fever, sleeplessness, and anorexia.

Wry neck disappeared after the removal of the rhinolith, but the neuralgia persisted.

71. MUSCHOLD adds to the literature a careful observation of his own. The well-known symptoms (apart from exophthal-

mus, which was absent in his case) improved or disappeared after the galvano-caustic removal of the posterior extremity of the lower turbinated body, which was not even extremely swollen.

NOLTENIUS.

72. GUÉMENT describes the case of a female with asthmatic attacks. At the examination of the nose the mucous membrane of the lower turbinated bodies and of the nasal septum appeared soft and impressionable, without being hypertrophied. Attacks set in immediately after examination with the probe. These places were cauterized, whereupon the attacks ceased for a longer period and returned later on less frequently. Pressure upon the gastric region also produced the attacks. Irrigations of the stomach for a long period had no effect. The observation of this case has not been concluded, since the patient moved away. Bok.

73. Malignant tumor of the nose and naso-pharynx with implication of the regionary lymph glands. *Left*: protrusion of the eyeball. Sight destroyed. Congestion at and close to the disc. *Right*: extreme contraction of the visual field. Venous hyperæmia and tortuous vessels at the background of the eye. After irrigating through the nose and discharging of offensive pus, the R visual field becomes normal in a week. Death ensued in a few weeks.

The result of the irrigation compels ZIEM to the abandonment of the former supposition of retrobulbar neuritis optica, but rather to the probable view of congestion from the nose to the interior of the eye through the path of the abundant collateral channels (ethmoidal, infra-orbital, and naso-frontal.)

ZARNIKO.

74. BERGONIÉ and MOURE cite and criticise the heretofore used operative procedures (resection, operation with the chisel, saw, and drill) and finally discuss electrolysis.

Miot prefers the monopolar method with the indifferent electrode in the opposite nostril. Garel uses the monopolar method with one or more needles connected with each other. According to the authors these methods are to be rejected; they advise, however, the use of the bipolar method.

The physical part of the paper has been carefully elaborated by Prof. BERGONIÉ with great expertness. GELLÉ.

75. There is, independently of the weak places of the nasal septum, situated at the level of the connection of the lamina perpendicularis and the vomer with the apophyses of the hard palate,

another weak place at the level of the central, stenosed portion of the lamina perpendicularis. These weak places may explain the deviations of the nasal fossæ. CHATELLIER's treatment differs according as to whether there is: (1) thickening; (2) deviation; (3) thickening and deviation of the septum. In the first case electrolysis and cutting forceps are best used. In the second case loss of substance causing perforation should be avoided; straightening is of no avail. The vertical dimensions of the septum should be lessened, saving thereby the soft parts. The author used for this purpose a method of operation which he considered to have been first devised and employed by him (1883). It has been, however, described by Hartmann (1882) and later on by Petersen, A. O. It consists in the following procedure: after anæsthetizing with cocaine, the prominent side is incised near the floor. The periosteum and perichondrium are raised and the partition wall penetrated, avoiding perforating the opposite mucous membrane. After resection of the bony fragment, periosteum is applied to periosteum. The union becomes complete in 58 hours. The author has successfully operated five cases in this manner. In deviations with thickening the simple removal of the thickening, or Hartmann's method, should be performed according to the requirements of the case. . GELLÉ.

76. SUCHANNEK had not to deal in his case with stenosis, but with complete occlusion of both choanæ. Both choanæ were occluded posteriorly by an osseous diaphragm. Operation with trocar after treatment by hard-rubber sounds introduced by the patient. The patient, aged eleven, was not hard of hearing. The sensation of taste was also well developed.

77. LUC, on account of his observation, has changed the heretofore prevalent and undoubtedly erroneous view, that empyema is always due to dental caries; for the teeth of his patient were perfectly normal and the empyema originated from facial erysipelas. The suppuration, evacuated from an opening of the fossa canina accordingly contained a pure culture of streptococci. NOLTENIUS.

78. LEMELLETTIER describes a case of empyema of the left Highmore's antrum following dental caries. After removal of the carious teeth, offensive pus escaped. An opening was made with the trocar in the region of the second molar tooth and the cavity irrigated with solutions of sublimate (1:2000). A canula was afterward introduced into the opening. Recovery took place in 45 days, after previous removal of the canula. Bok.

79. KUCHENBECKER fully reports 31 cases of suppuration of Highmore's antrum, observed by Siebenmann in dispensary and private practice. He points out that infectious diseases frequently cause empyema of the antrum maxillare, which probably recover, as a rule, spontaneously. In 5 cases of influenza the symptoms of suppuration of Highmore's antrum were noticeable from the first day. Pneumonia is to be considered as the cause of one case. Siebenmann preferred the drilling from the alveolar process by means of his double-edged gimlet-like trocar, and kept the opening open in a portion of his cases by means of a silver nail-like obturator. Among 5 acute cases of empyema, 4 recovered, and 14 among 24 chronic cases, one of these spontaneously. We emphasize the result of pathologico-anatomical examinations of the sphenoid antrum as follows: Siebenmann found the sinus sphenoidalis affected in a number of autopsies of influenza, in 3 of typhoid fever, and also in cases of vitium cordis, pleurisy, pericarditis, pneumonia, phthisis pulmonum, etc. In the cases of influenza the mucous membrane was highly swollen, gray, smooth or uneven, and in some instances fungous. The epithelium was found in sections to be exfoliated at places or swollen and in mucous degeneration, the mucosa with imbued serum, the submucosa loosened with formations of fissure or cyst like cavities. In the deeper layers of the mucous membrane numerous colonies of cocci were discovered.

KILLIAN.

80. CHIARI bases upon 21 new and 7 old observations the following rules for the treatment of empyema antri Highmori:

1. In very rare cases empyema caused by periostitis of the root may be removed by the extraction of the root only.
2. Regular irrigations of the nose may improve it considerably.
3. Injections into the antrum do not frequently lead to recovery, though usually to improvement.
4. In fresh suppurations, caused by periostitis of the dental root, a few injections usually produce recovery.
5. Successful injections through the ostium maxillare were made only in one case.
6. Systematic injection can easily be carried out from the alveolar opening.
7. Insufflations with iodoformized powder do not yield positive results.
8. The safest results are reached by plugging with iodoformized gauze.
9. For the purpose of plugging, an opening, 4 to 6 mm wide, is usually made from an alveolus, but less frequently from the fossa canina.

POLLAK.

81. It follows from NATIER's paper that mucous polypi do not present any peculiarities in children. Diagnosis and treatment do not differ from that of adults. According to this paper mucous polypi seem on the whole to be of rare occurrence in children; for the author could not collect but 21 cases, of which several had not been heretofore published. Among this number were two cases which were observed in the new-born.

GELLÉ.

82. SUCHANNEK discovered upon the nasal septum of a patient with severe epistaxis, opposite the anterior extremity of the lower turbinated body, a pedunculated tumor of the size of a cherry-pit. The examination of the tumor revealed a vascular fibroma.

83. DREYFUSS, in the beginning of his elaborate paper, containing a complete bibliography, communicated the history of a case of carcinoma of the nasal cavity observed by himself. In the second part of his paper he gives a brief synopsis of our knowledge of nasal carcinoma, and an especial description of rhinitis carcinomatosa, which he distinguishes from the numerous heretofore described sarcomata. The author discusses the different publications. He collates only 13 cases, among which one observation of his own. He points out the appearance of this affection in the upper portions of the nasal cavity in 7 cases among 13, and the rare occurrence of spontaneous hemorrhages, in contradistinction to the views of the text-books. Another characteristic is the rare infiltration of the adjoining lymph glands. Carcinoma of the nasal fossa does not seem to be associated with general metastases, an important symptom for the differential diagnosis of malignant sarcomata. The pain experienced from the beginning of the affection originated principally from accompanying empyema. Although the prognosis is quite unfavorable, the author advises the operation, at least the removal of a considerable portion of the tumor from the nasal cavity.

GELLÉ.

84. HALBEIS's paper of 52 pages is very elaborate and to the point; it treats of the pathology and treatment of adenoid vegetations and gives, of course, hardly any noteworthy and novel facts. In conclusion he recommends a modification of Schech's forceps—devised by him, for the removal of the vegetations.

ZARNIKO.

85. ALBESPY describes a case in which, in consequence of adenoid vegetations and hypertrophies of the turbinated bodies,

cerebral symptoms had appeared, consisting of headache, weakened memory, inability for mental labor, occasional asthma and nightmares, and conjunctivitis catarrhalis. After removal of the adenoid tumors and galvano-cautery of the turbinated bodies at several sittings, all pathological phenomena disappeared entirely.

BOK.

86. After general introductory remarks WROBLEWSKI discusses the occurrence of adenoid vegetations in the deaf-mute. He finds them to be of frequent occurrence in them. Whilst in general the frequency of adenoid tumors is from 7 to 7.8 per cent., about 57.5 per cent. of deaf-mutes are affected. The faucial tonsils are also frequently found to be hypertrophied in the deaf-mute (56.5 per cent.). The author therefore advises to examine the deaf-mutes carefully in this respect, and he hopes that their removal will prove very beneficial in some cases.

BOK.

87. LAVRAND reports two cases of relapses in adenoid tumors, one being repeated in one case. In order to avoid such relapses, the removal ought to be made in a very careful manner under narcosis, since remnants do not become atrophied, but may increase.

BOK.

88. The operation of fibromyxomata and fibromata is rendered difficult by the size and hardness; the seat of the tumors making it difficult to place the loop well around. The instruments devised by Goris and Lange are, according to WAGNIER, of no avail. He recommends the following method of operation, which he accidentally discovered. It is possible to reduce the tumor in size by crushing, and to place it with the finger into one nostril, through which it may be readily pulled with the snare, at one or several sittings. He mentions, in addition, a case in which by means of an ordinary metal probe he could tear off the pedicle of the tumor found in front through the anterior nares, whereupon the patient ejected it through the mouth.

BOK.

89. In opposition to Ziem, Bresgen, and others, POSTHUMUS MEYJES asserts that catarrh of the recessus is an affection *sui generis*. The author found in about 30 cases neither complications with suppuration of the nose, nor with that of the accessory cavities. The depression of the recess in the occipital bone, briefly called fovea and bursa pharyngis, was found to be very much marked in 25 among 360 skulls examined by him in the Museum Vrolik at Amsterdam; there were less marked foveæ in 50 skulls, and in 2 cases so large as to allow the introduction of a pea. Because

of the much greater frequency of a recess in the living, the author believes the fovea pharyngis to be present only in isolated cases. In the post-mortems of children the recess is always quite pronounced. He could positively determine with the rhinoscopic mirror, that the muco-purulent, frequently hemorrhagic expectoration arose from the recess. In five cases movable cyst was found which could on strong pressure be penetrated with a probe, whereupon the complaints of pressure and tension in the throat disappeared at once. The treatment of hypersecretion consisted in curetting with the small spoon devised by Kafemann, and subsequent cauterization with nitrate of silver. The treatment conclusively proved the correctness of the diagnosis, although relapses cannot always be prevented. Author's review.

90. GERBER discusses the isolated occurrence of syphilitic affections in the naso-pharynx, without implication of the nose and the lower part of the pharynx, and reports a cured case of his own. The posterior rhinoscopic picture is appended upon a colored plate.

91. LUBET-BARBON briefly describes Tornwaldt's disease. He recommends for treatment the use of the curette, as used by gynecologists. The affected places, particularly the so-called recesses, which may be up to $1\frac{1}{2}$ cm long, are, under the guidance of the mirror, sufficiently curetted and afterwards cauterized with solutions of nitrate of silver. This procedure is followed by inflammation, with profuse discharge and slight pain, which may radiate into the ears and last five or six days. The author has obtained very good results from this method. Bok.

92. CAPART presents a patient with pharyngeal vegetations, which disappeared wellnigh completely by electrolytic treatment, at first by the bipolar, then by the unipolar method. The patient, bore at first 10, then 25 milliampères. SCHIFFERS.

93. MOURE divides the hypertrophic tonsils into three groups : 1. Those which project far beyond the pillars. 2. Those which are completely surrounded by the pillars. 3. So-called pseudo-hypertrophies (collections of cheesy masses or other concretions). With reference to operative treatment, he recommends for the first group the tonsillotome in children and the galvano-cautery loop in older patients, who can keep quiet, on account of avoidance of hemorrhages. For the second group he recommends extensive incisions with galvano-cautery or knife.

The pseudo-hypertrophies should be opened with a blunt or

sharp hook, and the existing pouches obliterated by astringents or galvano-cautery. BOK.

94. At a meeting of the Clinical Society of London, ARBUTHNOT LANE brought forward a case in which he had found it necessary to tie the common carotid on account of very severe and recurrent hemorrhage from the tonsil. In the discussion which followed, it was pointed out that it was usual to tie the external carotid under these circumstances, and that ligature of the common carotid was a very dangerous proceeding. In his reply Lane remarked that in this particular instance he had practically no choice, on account of the manner in which the branches arose from the trunk of the external division of the main artery, and further, that he had never found any evil results arise in tying the common carotid, provided, as in this instance, the precaution were taken to inject a large quantity of salt solution into the veins directly after.

In reference to Lane's case, Mark Hovell suggests that, in some instances at any rate, the inefficiency of the astringents employed in these cases in the first instance is in great measure due to their faulty application, and he recommends that a paste of one part of gallic and three parts of tannic acid with a little water should be firmly rubbed into the bleeding surface with the surgeon's finger, counter pressure being made from the outside with the other hand. Bilton Polard relates a case in which he succeeded in actually ligaturing the two bleeding points and incidentally expresses the opinion that in many instances the digital enucleation of tonsils is both possible and to be preferred to their excision.

URBAN PRITCHARD, London.

Reviews.

Translated by Dr. MAX TORPLITZ, New York.

I.

Report on the Progress of Otology during the Years 1890 and 1891. By Dr. L. BLAU, Leipzig. Wigand, 1892.

The report gives in 294 pages a brief yet full summary of the papers published during the above-stated period, on scientific and practical otology, and is to be highly recommended to aurists, as well as the preceding report of the years of 1888 and 1889. Moos.

II.

Deaf-Mutism in the Grand-Duchy of Mecklenburg-Schwerin : a Statistico-Otological Study. By Dr. LEMCKE, Lecturer on Otology at Rostock. Leipzig, Lang Kammer, 1892.

This is a detailed report of the main results communicated to and approved at the meeting of German aurists at Frankfort, to the transactions of which we refer the reader. We recommend these exceedingly careful studies to all interested persons, viz., to aurists, practitioners, and also to administrative bodies. Moos.

III.

The Study of the Functions of the Different Parts of the Labyrinth of the Ear. By STANISLAUS VON STEIN, Vol. i. With 125 wood-cuts and 4 phototypes. Moscow, 1892.

This is an historical and critical representation of the physiology of the aural labyrinth up to the present date. I regret to say that this voluminous book, carefully and industriously published, covering 840 printed pages, and also the author's book on the *Literature of the Anatomy and Physiology of the Hearing Organ* (reviewed in a former number of these ARCHIVES), are written in Russian, and therefore will be hardly known and read in Germany. Moos.

IV.

Normal and Pathological Anatomy of the Nose and Its Pneumatic Appendices. By Prof. D. E. ZUCKERKANDL. With 24 lithographic plates. Vol. ii. Vienna and Leipzig, W. Braumüller, 1892.

This volume contains many very valuable additions to the first volume published ten years ago, which was reviewed at that time in these ARCHIVES. In nineteen chapters, illustrated by many clinical histories and excellent pictures, Zuckerkandl treats of the anatomy and fractures of the nasal septum, the etiology of deviations of the septum, rhinitis, habitual epistaxis, the round ulcer of the nasal septum, the inflammatory processes of the mucous membrane of Highmore's antrum, nasal polypi, atrophy of the turbinated bones, syphilis, tuberculous rhinoliths, osteoporosis of the turbinated bones and of the nasal partition, teeth grown into the nasal cavity and dental tumors, dental cysts, empyema, hydrops and polypi of Highmore's antrum, empyema of the ethmoid labyrinth, and finally a report of a tumor-like prominence of the upper cervical vertebræ extending into the pharynx.

The lively interest taken at present in the diseases of the nose and its accessory cavities, also by the aurists, renders this excellent work of the competent author highly welcome to the specialist. We do not enter more fully into the details of the work, and we limit ourselves to a warm recommendation of the book beautifully gotten up, from the contents of which even readers with large experience may derive many suggestions and instructions.

Moos.

V.

Baratoux. Guide Pratique pour l'Examen des Maladies du Larynx, du Nez, et des Oreilles. (Practical Guide to the Examination of the Diseases of the Larynx, Nose, and Ears.) Part viii., 334 pages, with 181 engravings in the text and an atlas of 186 pictures.

This work gives a concise introduction to the physical examination and treatment of the organs enumerated in the heading, and also the etiology, symptoms, diagnosis, and prognosis of these affections. The hearing organ is dealt with in a brief and concise manner; the French and foreign literatures are carefully considered. The numerous illustrations are excellently executed.

Moos.

VI.

Anatomical Examination of the Paths of the Blood-Current in the Labyrinth of the Human Ear. By O. EICHLER. With 4 plates and 3 wood-cuts. Leipzig, 1892. Reviewed by F. SIEBENMANN, Bâle.

The endosteum of the cochlea and the organic substance of the closely adjoining osseous layer prove in corrosion to be of much resistance, but Eichler succeeded in the isolation of Steinbrügge-Barth's celloidin casts of the cochlea¹ in connection with this covering fundamental membrane. In this way the author made a step forward, by injecting the vessels of the inner ear beforehand from the carotis communis and from the arteria basilaris, and finally thus obtained specimens, which, inferring from the beautifully colored illustrations and from the careful description, give heretofore unattained explanations of the vascularization of the cochlea. The advantages of a non-dissected, injected specimen over a series of sections have been apparent from the *reviewer's* specimens of the labyrinth made with Wood's metal (cf. *Corrosion Anatomy*, Fig. 10), and this will be all the more the case if the parts to be examined are transparent in addition.

With reference to the fuller details of the technique, we refer you to the original. Eichler succeeded in filling the arteries wellnigh completely, but the veins less completely, so as to be compelled to supplement their study by means of metal corrosions. (The difficulty mentioned by Eichler of filling the veins from the jugular or from the sinus is confirmed by the *reviewer* from his own repeated experience.)

According to Eichler's description of his injected casts the extremely tortuous *arteria* auditiva passes undivided through the meatus and the tractus foraminulentus; it divides at the level of the first half cochlear turn into the vestibular and the cochlear branches. The former runs to the sacculus utriculus and the semicircular canals; the latter, however, follows spirally the turns of the cochlea, being attached to "the root of the vestibular, intermediary wall." Its extremity becomes bundle-like at the cupola. The cochlear artery supplies the spiral lamina and the walls of the vestibular scala, which arrangements corre-

¹ Transactions of the "Physiolog. Gesellschaft" at Berlin, 1888-'89, reviewed in the *Zeitschr. f. Ohrenheilk.*, vol. xix., p. 347, and *Med. Centralbl.*, 1889, p. 545.

spond with Schwalbe's description. In accordance with the formerly (*l. c.*) published, here not considered, results of examination of the *reviewer*, Eichler found, "that the glomeruli arteriosi of the cochlea described by Schwalbe, could not be demonstrated in man." We shall enter further below into the descriptions of the smaller branches of the artery.

If we follow the course of the cochlear vein according to Eichler's description, from the cochlear base toward the apex, we find it divided at the lowest half turn into two large branches. One branch continues as vena spiralis modioli (Schwalbe) and ends, as has been described by the *reviewer* (*l. c.*) toward the basal turn; the other ascends directly, curving off abruptly, into the middle turn, in order to take thence as vena spiralis the flat spiral course of the tympanal scala in the modiolus. The main trunk receives, near the apertura interna aquæductoris cochleæ, additional branches from the vestibule, and anastomoses in the manner mentioned by the *reviewer* (*l. c.*) with the veins of the vestibular aqueduct.

With reference to the capillaries, Eichler arrives at the conclusion that Schwalbe's description is justified, inasmuch as the afflux of the cochlear circulation takes place through the scala vestibuli, the efflux through the scala tympani; that, however, arterial as well as venous nets spread in either scala. The author mentions the following three main capillary provinces as separate and independent of each other: those of the modiolus, of the lamina spiralis ossea, and of the walls of the scalæ. The latter presents somewhat complicated relations, inasmuch as here four subdivisions should be distinguished, having this in common that they form connections neither with vessels of the basilar membrane nor with those of the surrounding bone; among these four small capillary nets of the walls of the scalæ, two run in the tympanal or in the vestibular portion of the spiral ligament respectively, another upon the tympanal, and the fourth upon the vestibular, surface of the intermediary wall. There exists no vas spirale of the basilar membrane or of the crista.

There are no descriptions of the course of veins and arteries in the semicircular canals, neither in the text nor in the illustrations.

This brief extract may suffice to excite the reader to the study of the original, and to control the results by preparing such specimens. The *reviewer* hopes to resume this paper at a future occasion.

VII.

Handbuch der Ohrenheilkunde, written by a number of representative aurists ; edited by H. SCHWARTZE.

The first volume of this cyclopedia of otology has just appeared, and contains, in fifteen chapters, what may be called general otology ; macroscopic anatomy of the ear, by Zuckerkandl, histology by Kessel and Steinbrügge, . . . pathological anatomy by Habermann, circulation and nutrition by Bezold, etiology by Moos, therapeutics by Wagenhäuser. It gives an immense amount of information written by authoritative pens.

The second volume will contain special otology ; the operations on the ear to be described by Schwartz.

This exhaustive work needs no special recommendation ; it will be indispensable to every thorough aural surgeon. H. K.

VIII.

The Mastoid Operation. By SAMUEL ELLSWORTH ALLEN. pp. 111. Robert Clarke & Co., Cincinnati, 1892.

This little volume cannot fail to interest all who have devoted attention to this branch of special surgery.

The history of operative procedures upon the mastoid process is written in such a way that the reader is able to trace without difficulty the successive advances made in the operation, from the crude efforts of Petit and Jasser to the perfected procedure of the present day.

The chapter dealing with the anatomy of the parts is clear and concise, the points bearing upon the operation being brought forward prominently, while a detailed description of those portions of the temporal bone, not immediately concerned, is wisely omitted.

In considering the pathological conditions which necessitate the performance of the operation, we are particularly impressed with the clear statement of the various views held as to the true nature of cholesteatoma. In no other work, as far as we know, have the various theories as to the causation of this obscure condition been so well stated. The author does not commit himself to any one view, but emphasizes the necessity of the thorough removal of every vestige of the mass. Special attention is called to the condensing osteitis caused by these epithelial aggregations, resulting in a partial or complete sclerosis of the mastoid.

The directions for the operative technique are simple and easily understood. The great value of thoroughly clearing the passage between the antrum and tympanum of all granulation tissue and softened bone is recognized, and special stress is laid upon this point. If pus is not found in the antrum, the author advises an exploration of the cells at the apex; it has been our usual practice to do this in every case, as pus may be retained here, even if a collection in the antrum has been evacuated.

With reference to after-treatment, it has been our experience that, when the mastoid has been opened, and free communication with the middle ear established, there has seldom been any discharge from the meatus; the ear itself needing almost no attention. We have also rarely found it necessary to dress the wound daily at any period after the operation.

The directions for the performance of Stacke's operation are explicit, and the advantages of the procedure on the treatment of cholesteatoma are favorably impressed upon the reader.

The author is to be congratulated on the attractive manner in which he has presented the subject, the work being very concise, and this without the omission of any important details.

The plates and cuts are original and add greatly to the value of the brochure.

E. B. D.

MISCELLANEOUS NOTES.

A.—BRITISH.

SOCIETY MEETINGS.

BRITISH MEDICAL ASSOCIATION—East Anglian Branch.—At the meeting held at Sherringham on September 8, 1892, Professor Victor Horsley gave an address upon The Dangers and Consequences of Prolonged Otitis Media, with Special Reference to Cerebral Abscess. The interest of the address was much enhanced by the exhibition of a beautiful series of photographs from macroscopic and microscopic specimens, shown by means of the lantern.

BRITISH LARYNGOLOGICAL AND RHINOLOGICAL ASSOCIATION.—At a recent meeting, Mr. B. Hewetson, of Leeds, read a paper on The Relation between Various Forms of Nasal Stenosis and Deafness. Mr. Hewetson advocates his well-known plan of forcibly dilating the nares in these cases, and for this purpose he employs an instrument very much like the ordinary glove stretcher. .

NORTHUMBERLAND AND DURHAM MEDICAL SOCIETY.—At the October meeting of this society Dr. Robertson exhibited a case of mastoid disease, showing recent methods of operating.

MIDLAND MEDICAL SOCIETY.—At the meeting of this society held on October 19, 1892, Mr. Heaton showed an aural polypus which he had removed by means of the galvano-cautery from a patient aged sixty, in whose ear it had been growing for the last eighteen years. The special interest in the case lay in the great size of the tumor.

HARVEIAN SOCIETY OF LONDON.—Mr. G. P. Field is to be congratulated upon being selected to deliver the special course of

Harveian lectures before this society on December 1, 8, and 15, 1892. Mr. Field chose for his subject *The Pathology and Treatment of Suppurative Diseases of the Ear*.

MEDICAL SOCIETY OF VICTORIA.—At the meeting at Melbourne on July 4, 1892, Dr. Barrett read a paper on a case of Chronic Suppuration of the Middle Ear; Petrous Necrosis; Meningitis; Death. The patient was a male aged twenty-four. The discharge from the ear had existed from childhood; acute head symptoms were of eight weeks' duration. Dr. Barrett gouged away the mastoid freely, opening it into the external meatus, but the patient died in a few days. At the post mortem general suppurative meningitis extending along the sheath of the auditory nerve, was discovered.

It had been decided to hold the next International Otological Congress at Florence; bearing in mind, however, that the International Medical Congress is to meet at Rome in the last week of September, 1893, it does not seem unnatural that proposals should be made to transfer the Otological Congress to this latter city. Whatever may be the final decision upon this point, the next Otological Congress will probably receive an invitation to hold the ensuing Congress (1897) in London.

B.—AMERICAN.

SOCIETY MEETINGS.

Before the N. Y. ACADEMY OF MEDICINE on Oct. 6, 1892, Dr. H. Knapp read a paper on *Otitic Brain Disease: Its Varieties, Diagnosis, Prognosis, and Treatment*, with illustrative cases from his own practice. He spoke of the transition of otitic meningeal irritation into meningeal inflammation, laid stress on the recognition of those forms of ear disease that are most apt to produce brain trouble, viz., attic disease, and mastoiditis perforating on the medial side. Among the cases reported may be specially mentioned one with a double brain abscess and sinus thrombosis, fatal, autopsy; one with thrombosis of cerebral sinuses and the internal jugular vein, cured by an extensive operation on the mastoid. Two cases of extradural abscess with perforation of the occipital bone, the first fatal, with autopsy; the second cured after opening of the mastoid. The substance of the paper will be published in these ARCHIVES.

THE NEW YORK OTOLOGICAL SOCIETY held its regular meeting at the office of Dr. John L. Adams, No. 17 West 45th Street, on Tuesday, Nov. 22d, at 8 P.M.

Dr. H. A. Alderton presented a patient upon whom he had operated successfully for an extensive caries of the mastoid.

Dr. J. E. Sheppard exhibited a temporal bone removed from a patient who had died from a cerebellar abscess, resulting from caries of the mastoid. The mastoid had been operated upon as soon as symptoms indicative of its involvement presented.

Dr. Dench presented the malleus, incus, and stapes removed from a patient suffering from chronic purulent otitis, with caries of the malleus and incus. The stapes had been removed in the hope of improving the hearing, and the result had been satisfactory.

Dr. James Hewitt presented an incus hook of original design ; also an improved middle-ear syringe.

Dr. Dench presented a head-and-shoulder rest, for supporting patients in the semi-recumbent position during operations upon the middle ear.

Dr. Bacon reported a case of mastoiditis, following the auto-insufflation of salt water into the nostrils, for the relief of nasal stenosis.

Dr. Pomeroy reported two cases of atresia of the external auditory meatus, one of congenital, the other of traumatic origin. Both were operated upon, and in one a satisfactory result was obtained. The operator advocated the use of the soft rubber drainage tube in these cases, introduced in such a way as to exert a continuous dilating force by its own elasticity.

Dr. Toeplitz reported a case of otitis interna of specific origin. The aural symptoms in this case appeared at the same time as the cutaneous roseola.

The following officers were elected for the ensuing year : President, Dr. Albert H. Buck ; Vice-President, Dr. Emil Gruening ; Secretary, Dr. E. B. Dench.

At the meeting of the SECTION ON LARYNGOLOGY OF THE NEW YORK ACADEMY OF MEDICINE, held November 23, 1892, Dr. W. Freudenthal read a paper on *Asepsis or Antisepsis in Nasal Surgery?* He favors careful asepsis. In the discussion which followed, Drs. M. J. Asch, S. Myles, C. C. Rice, H. H. Curtis, Jon. Wright, and Wendell C. Phillips took part.

At the same meeting Dr. J. E. Newcomb read a paper on *The Question of Hemorrhage after Operations for Adenoid Growths, with Report of a Fatal Case*. This case was a child of three and a half years with anæmia and catarrhal bronchitis. Three hours after operation hemorrhage began and continued all night, but the parents did not summon a physician until 6 A.M. the next morning, when the child was too much exhausted and died. (Dr. Newcomb favors operating with the head thrown backwards, and we think that this position is more likely to tend to a lesion of any larger blood-vessel than when the patient sits erect.—W. F.) Dr. S. O. Vander Poel then reported a case of hemorrhage after removing adenoid vegetations, where recovery followed by tamponing. Drs. Jon. Wright, H. H. Curtis, and S. Myles expressed their experiences in like cases.

The next meeting of the AMERICAN MEDICAL ASSOCIATION will be at Milwaukee from June 6th–9th, during the progress of the Columbian exposition at Chicago. SECTION OF LARYNGOLOGY AND OTOTOLOGY: President, E. L. Shurby, Detroit; Secretary, J. E. Boylan, Cincinnati.

NEW INSTITUTIONS.

THE NEW YORK THROAT AND NOSE DISPENSARY opened in March, 1892, at 833 Third Avenue, New York. The hours of attendance are from 2–3 P.M. and 7:30–8:30 P.M. daily.

The staff is as follows: SURGEONS: Edward J. Bermingham, M.D., Nathan S. Roberts, M.D., Max Toeplitz, M.D. ASSISTANTS: W. P. Broderick, M.D., Samuel Goldstein, M.D., G. B. McAulife, M.D.

A night dispensary for the treatment of diseases of the EYE, EAR, NOSE, AND THROAT has been instituted at ST. BARTHOLOMEW'S PARISH HOUSE, New York, No. 209 East 42d Street. Dr. John L. Adams and Dr. Fred. Whiting are the surgeons in attendance.

APPOINTMENTS.

Dr. ALBERT H. BUCK has been appointed Consulting Otologist to the Presbyterian Hospital, New York.

Dr. EDWARD B. DENCH has been appointed Professor of Otology at the New York Polyclinic.

Dr. WALTER VULPIUS, formerly Assistant of Dr. Stacke in Erfurt, Germany, has been appointed Assistant Surgeon to the Aural Department of the N. Y. Ophthalmic and Aural Institute.

Dr. MAX THORNER has been appointed Professor of Laryngology and Otology at the Cincinnati College of Medicine and Surgery.

Dr. L. KATZ has been admitted to the Medical Faculty of the University of Berlin as lecturer (Privatdocent) on Otology.

Obituary.

By the death of Mr. EDWARD COCK London surgery has lost one of the few remaining links connecting it with the past. He died at Kingston at the ripe old age of eighty-five. Few probably are aware that, as far back as 1834, he communicated to the London Medico-Chirurgical Society a paper "On Malformation of the Internal Ear, being the Result of Post-Mortem Investigations Performed in Five Cases of Congenital Deafness."

The greater part of Mr. Cock's work was done in connection with Guy's Hospital, of which institution he was consulting surgeon for the last twenty-one years.

Fig. 1.

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Fig. 2.

Fig. 3

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Fig. 5.

Fig. 6.

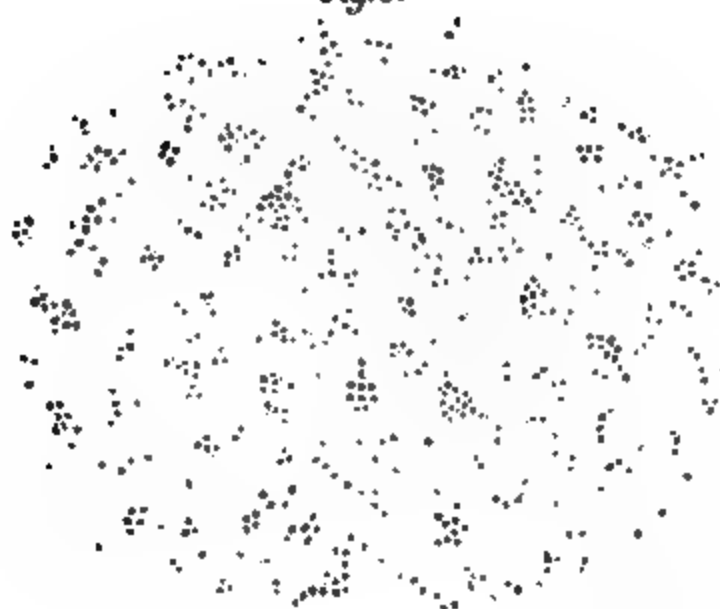


Fig. 4.

stp

gckn

Nf

rpt

ARCHIVES OF OTOTOLOGY.

OTITIC BRAIN-DISEASE; ITS VARIETIES, DIAGNOSIS, PROGNOSIS, AND TREATMENT, ILLUSTRATED FROM CASES OF THE WRITER'S PRACTICE.¹

By HERMAN KNAPP, M.D.

THE gravity of the extension of inflammatory processes from the ear to the brain has at all times been duly appreciated by the profession, but only during the last decades have their pathology, diagnosis, and treatment been systematically studied. This study has received its chief impulse by the progressive development of operative procedures which in originality of design, boldness of execution, importance of object, and brilliancy of results are unexcelled by the handling of any other group of diseases. The saving of life by evacuating a cerebral abscess or cleansing a sinus filled with pus may certainly be reckoned among the triumphs of modern surgery, but a greater service is rendered to our fellow-men by the general practitioner, and, in particular, the aural specialist, if by timely diagnosis and judicious management of the dangerous forms of ear disease they prevent brain abscess and sinus thrombosis from developing. All suppurative ear diseases may eventually prove fatal by involving the brain. Yet it does not behoove an honest physician to sound the alarm bell at every case of earache or otorrhœa, criminal though it be to neglect either. The warning signal should be given as soon as meningeal irritation is noticed. This being the initial step of otitic brain disease, I shall consider it first, and then suc-

¹ From a paper read before the New York Academy of Medicine, Oct. 6, 1893.

cessively discuss otitic meningitis, extradural suppuration, cerebral and cerebellar abscess, and sinus thrombosis, all of which I am able to illustrate by cases of my own practice. I shall not weary you with detailed clinical histories, but briefly report a certain number of cases to serve as basis of my descriptions and as support of my views.

The chief symptoms of
Meningeal Irritation are :

Headache ;

Occasional nausea, vomiting, and dizziness ;

Moderate increase of temperature ;

Some acceleration of the pulse.

The two latter symptoms, though mostly present, seem to depend more on the virulence of the primary disease, the otitis, than on the meningeal involvement.

Thirst, loss of appetite, and constipation are mostly complained of, but they are not characteristic. The percussion of the skull is either painless, or painful only in the nearest vicinity of the ear, namely above and behind the auricle. The differential diagnosis between meningeal irritation and true meningitis is very difficult, and here the practical question, whether, when and how, to operate is of paramount importance. The decision will depend upon a careful examination of the different parts of the ear. The least likely to develop intracranial complications are the cases of *acute catarrhal or suppurative otitis media*, the common otorrhœa, caused by acute rhino-pharyngitis, from exposure, sea-bathing, measles, and scarlet fever. The pain is in the ear and head, aggravated at night, relieved by opiates, leeches, cold applications around the ear, especially the Leiter coil ; yet in many cases the warm douche, by a fountain syringe, gives more relief. Before these remedies, with proper cleansing, antiseptics, and rest in bed have been tried, no operation need be considered, for none of the above symptoms is alarming.

In the year 1878¹ I put together all the cases of acute otorrhœa which had come under my care in private practice during the first ten years of my stay in New York. Their

¹ ARCHIVES of OTOL., vol. viii., pp. 1-25.

number was 182, which was 7.2 per cent. of the whole number. There were 4 fatal cases among the 182, *i. e.* 2.17 per cent. This seems a high mortality. I do not know whether the results of my later practice have been more favorable, not having compiled any further statistics. I must say that at that time I was not in favor of much operating on the ear. In the above series of cases I made paracentesis of the drumhead but rarely, and never opened the mastoid. Two of the fatal cases (from meningitis) might possibly have been saved by the latter operation.

The practical question at the beginning of an inflammation of the ear is:

Which, under equal severity of the general symptoms, are the LOCAL CHANGES that, more than others, give rise to brain complications? The following two may confidently be pointed out as such:

(A) *The attic affections, and*

(B) *The perforations at the medial side of the mastoid process.*

A—It is well known now that the inflammations of the cupola-space (attic) are slower to heal and much more dangerous than those of the lower part of the drum cavity, the atrium. The narrow slit which separates the attic from the atrium is readily blocked by the swollen mucous membrane, and it is a matter of record that the pus, even after spontaneous or artificial free perforations of both the membranæ flaccida and tensa, finds no easy outlet into the external ear canal. Seeking another outlet three ways are open:

(a) *Upward and outward (laterally) into the pneumatic spaces of the squama, above the ear canal,*

(b) *Backward through the antrum into the mastoid process,*

(c) *Straight upward through the tegmen tympani into the middle cranial fossa.*

(a) The *first category* is well illustrated by the following case:

Acute suppurative inflammation of the attic; paracentesis of the drumhead, spontaneous and artificial perforations of the outer table of the squama; recovery.

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(a) The first category is well illustrated by the following

case:

Acute suppurative inflammation of the attic; paracentesis of the drumhead, spontaneous and artificial perforations of the outer table of the squama; recovery.

J. J. O'Sullivan, thirty years old, of a healthy constitution, contracted a severe cold March 12, 1892. Earache, increasing every day, made him consult me March 16th. I found the drum-head and the adjacent walls of the ear canal intensely red, Shrapnell's membrane bulging. I ordered him an alum gargle, and two leeches and iced compresses behind the ear. The symptoms were not much relieved. Though the drumhead became less red, the upper part continued bulging. On catheterization, I found the tubes open and heard no moist râle. I ordered warm boric-acid water douches for the ear, and as they brought no relief, made a paracentesis in Shrapnell's membrane, and another in the posterior lower part of the drumhead the next day, but liberated no pus. Twelve days after the onset of the affection the ear began to discharge. Very gentle syringing with warm boric-acid water was ordered. The discharge continued and relief was felt for a few days. Then the discharge stopped, severe earache returned, and was accompanied by violent pain in the head, chiefly around the ear. I tried to bring the discharge on again by steaming and douches with warm boric-acid water. This object was not attained; on the contrary, the swelling at the upper and posterior parts of the drumhead and adjacent walls of the canal increased, the headache grew most intense, the integument behind and above the ear was swollen, and the angle between the auricle and mastoid obliterated. I made a Wilde's incision down to the bone on April 9th. The pain and swelling in and around the ear diminished for a few days but then returned with increased force. Reopening the previous Wilde's incision, on April 13th, liberated no pus. The swelling and tenderness became more marked above the ear. I therefore extended, on April 15th, the previous incision upward, and evacuated a great quantity of thick pus. The probe discovered rough bone, and penetrated into a cavity fully half an inch directly above the auditory canal. After enlarging the fistulæ with a sharp spoon and curetting the cavity which extended considerably—at least half an inch in every direction—around the opening, I inserted a perforated silver tube. The patient felt better, but as the swelling of the posterior wall at the end of the auditory canal continued, I made, May 5th, a free incision through the bulging upper and posterior part of the membrana tympani and adjacent canal. This incision was followed by a copious hemorrhage, but had apparently no effect, the pus escaping through the drainage-

tube above the ear. The ear canal was syringed and the tube changed once or twice daily. For a few days the whole left side of the face was swollen, the neck remained normal, but behind the ear a fluctuating spot developed, which was incised and a considerable quantity of pus let out.

Headache, sleeplessness, mental depression, and lassitude, but no fever of any account, were the subjective symptoms, more or less marked, during the course of the inflammation.

July 18th the discharge stopped permanently and the tube was left off. July 22d the drumhead was restored, pinkish, the lower part in its natural position, the upper still somewhat bulging. $h = \frac{5}{8}''$; $v = \frac{3}{8}''$. August 12th, condition good. Sept. 28, 1892, $h = \frac{5}{8}''$; $v = \frac{3}{8}''$: other ear, $h = \frac{3}{4}''$; $v = \frac{3}{8}''$. I saw the patient again three or four months later. He had been free from discomfort, and both ears were normal.

I think this case is quite instructive. An acute coryza extends quickly to the attic. Incisions of Shrapnell's membrane, the membrana tympani proper, and the skin and periosteum of the adjacent portion of the ear canal give no relief, nor does a Wilde's incision behind the ear. The pus, after discharging through the ear canal for a few days, is retained, forms an extensive cavity in the pneumatic spaces above the ear, and breaks through a fistula under the periosteum of the outer surface of the squamous portion. Thorough opening, curetting, and draining of this cavity afford relief, but permanent recovery takes place only after nature has made another opening lower down. Pus may have passed from the upper air-cells into the mastoid antrum, and here produced a perforation at the usual place, but it is just as likely that the pus in the mastoid was the result of a new focus of suppuration, just as in the ear canal we see separate furuncles in different places. It is always advisable to open an abscess where it points, but it is certainly a good rule in all cases of extension of suppuration from the tympanic cavity to open the mastoid antrum, because it is the origin and centre of the system of pneumatic spaces around the ear. Suppuration may start in other places, as in the above case it undoubtedly did, but it usually culminates and ends in the antrum.

(b) The *second category* of purulent inflammation of the attic—and the tympanic cavity in general—where the supuration passes through the antrum into the mastoid process, is the most common. In the majority of cases it ends in recovery after spontaneous perforation of the outer table of the mastoid, forming the well-known post-aural abscess.

This affection is too common to need illustration by reports of cases.

(c) The *third category* of attic affections, that in which the inflammation travels through the tegmen tympani straight upward into the middle cranial fossa is the most dangerous, though not so frequent as the preceding. The stage of meningeal irritation may pass into real meningitis in a few days and end fatally in one or several weeks. I recall a case communicated at the Am. Ophthalmological Society, which ended in death by meningitis five days after the onset of the earache. A few similar cases are on record. Cases ending fatally within a fortnight are not so rare. A patient, a decrepit man of seventy-one, mentioned in my report spoken of above,¹ died on the 11th day. His symptoms were: pain in ear and head, otorrhœa, walls of ear canal swollen, pulse 120, temp. 99°. The discharge stopped on the 7th day, increased headache and great debility set in and the patient died 4 days later. When the discharge stopped, or even before, the mastoid ought to have been opened.

B—The second group of cases that are distinguished by their gravity and their tendency toward intra-cranial complications is that in which *the pus seeks an outlet through the medial (inner) side of the mastoid process, the so-called Bezold perforation*. Pus, as every liquid, moves in the direction of the least resistance. It is therefore the anatomical conformation that determines the location of the perforation. When the outer table is thick, the pus breaks either through the anterior wall of the mastoid (the posterior of the meatus) into the ear canal, or through the medial wall of the tip into the digastric fossa, or again it forces its way into the

¹ ARCH. OF OTOL., viii., p. 18.

cranial cavity, be it through the base and attic into the middle, or through the inner table into the posterior fossa.

The cases in which the pus seeks its outlet into the ear canal are rare. The posterior wall of the osseous portion is perforated and the calibre of the canal occluded by pushing the periosteum and skin to the opposite side. The following case is a good example of this variety.

Purulent inflammation of tympanic cavity and mastoid ; perforation of osseous wall of canal ; deep incision ; recovery.

Mrs. K. R., æt. twenty-five, anæmic, had otorrhœa when twelve years old. She consulted me April 6, 1889. Two weeks previously she had violent earache followed by otorrhœa. The purulent discharge was thin, bloody, and copious. Walls of canal so swollen that *Mt* could not be seen. Examination of the discharge for tubercle bacilli negative. Rest in bed, cleansing with a warm solution of boric acid, then warm douches. April 11th, the discharge stopped, the surroundings of the ear became swollen and tender, especially over the mastoid and down the neck. She had pain in and around the ear extending down the neck toward the shoulder. April 18th, has grown very feeble, pain in ear continues. Headache and some fever. A few days later, as the local and general symptoms kept increasing, a deep incision of the swollen posterior wall of the ear canal was decided upon and if it liberated no pus the mastoid was to be opened. The patient being under ether, I made a long incision through the integument of the posterior wall, down to the bone. A great deal of thick pus escaped. I inserted a silver draining tube through which the pus flowed freely for several days, then it gradually diminished and soon ceased altogether. The swelling around the ear disappeared, last that of the mastoid. The recovery, with normal hearing, has been perfect and up to now, three years and a half, there has been no relapse.

This case may fairly be considered as a severe otitis media. Bloody purulent discharge always indicates great intensity of an inflammation. As long as the pus found an outlet through the ear canal there was no great discomfort, but when the discharge stopped the local and general symptoms increased and were relieved as soon as the knife re-es-

tablished a free outlet. The swelling in the canal was uniform, the skin neither red nor tender to the touch as in furuncles. The extension of the swelling and tenderness down the neck, as well as the pain extending toward the shoulder, make it possible that the pus sought and to a certain degree found an outlet at the medial side of the tip of the process, besides through the posterior wall of the canal.

Dr. GUYE, of Amsterdam, recently published a very remarkable case in point.¹ In a man who had a swelling below the tip of the mastoid, from a perforation at its medial wall, he removed, with a ring-knife, a small polypoid granulation from the posterior wall of the osseous meatus, and saw that pus exuded through a fistula in the canal, more abundantly when he pressed upon the mastoid. Some days later an opening was made at the anterior margin of the sterno-cleido-mastoid muscle and a great deal of pus evacuated. Dr. Guye introduced a tube into the opening, and water, injected into it, freely escaped through the above fistula out of the ear. There was facial paralysis in his case. The mastoid was cleansed by daily injections of water through the tube. The patient recovered completely. In our case, it seems that the same condition was preparing, but was prevented from developing so far by a free incision in the ear canal.

A typical and very happy case of this variety is the following :

Attic disease ; mastoid and head of sterno-mastoid muscle swollen ; large opening of mastoid ; recovery.

Anthony Saunders, forty-three years old, of New York, came to me April 20, 1890. He is employed in the repair shops of the elevated railway, and has to go over the tracks, exposed to all kinds of weather. His disease began with dizziness and pain in the left side of the back of his head. He had no coryza at the time. The next day he felt pain in his left ear. This, as well as the headache and dizziness, increased for a week. Then he consulted an aurist, who made a paracentesis of the drum, immediately after which on Valsalva's experiment air whistled through

¹ ARCHIVES OF OTOL., vol. xxi., p. 320.

the ear. The doctor treated him five weeks, "pricking in his ear and drawing blood every now and then" (probably repeated paracentesis). The patient found no relief; on the contrary, the pain in and around his ear, and all over the left side of his head, increased and became so violent, that he thought he could not endure it any longer. Then the doctor said an operation on the bone behind his ear was necessary. The patient consulted with his family physician, who sent him to me. I found there was free discharge from the ear, the walls of the meatus near the drum and the mastoid were swollen. I ordered warm ear baths and a mild astringent. The headache diminished. There were no other symptoms. Two weeks later the picture changed. The discharge stopped, the headache became violent, the swelling of the mastoid increased, and extended down the neck. There was great sensibility to the touch on the mastoid, and the upper part of the sterno-cleido-mastoid muscle. This region was red and hard. There was no nausea, no dizziness, no rise of temperature, as far as feeling with the hand could discover. I told him that an operation was now unavoidable, and should be done without delay. He consented at once, and I performed it before the students at the New York Ophthalmic and Aural Institute, April 8, 1890, stating that it was one of the cases of attic suppuration, where the pus retained in the mastoid was seeking an outlet at the medial wall of the tip, *i. e.*, into the digastric fossa. The proper treatment was not to wait until the perforation had taken place, and the pus was collecting and spreading between the fasciæ of the neck, or extending into the cranial cavity, but to furnish a free outlet for it at once. This should be done, not by tapping the mastoid at its tip, even if the greatest swelling and painfulness were there, but nearest to the source of the pus, the antrum of the mastoid and the attic of the drum.

Accordingly, I opened the mastoid at the level of the upper wall of the ear canal, near the insertion of the auricle, struck pus after having chiselled 4 or 5 *mm* through hard and healthy bone, dilated the opening by the removal of a wedge-shaped piece of bone the broader end at the base, the smaller at the tip of the process. There was an abundance of pus in the antrum and all the accessory cells.

The patient made a rapid and complete recovery. Earache and headache disappeared at once. The discharge from the ear had ceased the next day. The pulse and temperature were nor-

mal. The discharge tube was left off on the twelfth day after the operation. The wound closed on the nineteenth. No tenderness on mastoid. The patient felt well and left the hospital. Three days later he came to the Dispensary feeling well, $h = \frac{1}{4}$ ', $v = \frac{3}{8}$ ', F A > O. May 15th his hearing was $h = \frac{3}{4}$ ', $v = \frac{3}{8}$ '-. October 4, 1892, $h = \frac{6}{8}$ ', $v = \frac{3}{8}$ '. Has had no trouble from the ear, continues his former occupation. *Mt* entire, a little dull, with an indrawn scar above the short process of the malleus.

This case was certainly a gratifying example of preventive surgery. Another one of the same kind, but neglected, terminating fatally from cerebral abscesses and sinus thrombosis, will be mentioned later. The specimen showed the perforation on the medial side of the tip of the mastoid.

It is difficult to recognize when meningeal irritation passes over into true

Meningeal Inflammation.

As soon as in the course of otitis media, with its manifold symptoms, the

headache becomes persistent, is followed by

attacks of nausea and vomiting,

dizziness,

drowsiness, delirium, or stupor,

at first acceleration, later retardation of pulse, and rise of temperature,

dry tongue, thirst, and constipation,

we may be sure that meningitis has begun or is fully developed; the lethal issue is commonly preceded by

spasms in the extremities, and

coma.

When meningitis is imminent, warm ear baths to stimulate the otorrhœa, and cold applications behind the ear, especially by the Leiter coil, day and night, are of service. Anything in the ear canal or tympanic cavity that prevents the escape of the pus should be carefully removed. If in spite of this treatment the cerebral symptoms do not abate, especially if they aggravate and the otorrhœa stops, the

mastoid should be opened. This operation ought not to be delayed, for only in the initial stage can the life of the patient be saved. Even under the continuance of free discharge, the persistent excruciating headache, especially if the mastoid is puffy and tender, makes trephining of the mastoid advisable. I reported such a case before the Am. Otol. Soc. in 1879.¹

A ship engineer contracted a severe naso-pharyngeal catarrh, followed by earache and otorrhœa. After relief of a few days, return of earache and, while the discharge continued profuse, excruciating headache persisted three weeks. I trephined the mastoid, evacuated pus, and drained the wound. The headache ceased at once and permanently, the membrana tympani was restored in two weeks, the wound in the mastoid closed in four weeks, and the hearing was normal again in six.

It is not at all impossible that in such cases the meningeal irritation is not caused only by congestion and œdema of the adjacent parts, *i. e.*, the meninges over the roof of the tympanic cavity at the floor of the middle cerebral fossa and around the lateral sinus in the occipital fossa, but pus may actually penetrate into the cranial cavity through natural or pathological defects in the bone, or follow the offsets of the dura mater into the attic along the petro-squamous suture or along the walls of perforating blood-vessels. This pus need not necessarily call forth a general meningitis, but may, if by trepanation of the mastoid its source is stopped, become absorbed as hypopyon quickly disappears from the anterior chamber of the eye when the corneal abscess has been burned out or split. In evidence of this proposition I shall, later on, detail the recovery of an undoubted case of extra-dural abscess after opening of the mastoid. If, however, the source of the suppuration is not stopped, the pus penetrating from the ear into the cranial cavity may not all be *pus bonum et laudabile, i. e.*, pus in which the microbes are dead, but infective pus as is given off by all acute suppurative processes. In this way the meningeal irritation develops into

¹ *Transactions*, vol. ii., p. 350.

meningitis proper. Cases of this kind are frequent and need not here be exemplified.

Extra-dural Abscess.

This affection has received considerable attention of late. I have seen three marked cases of it, two fatal, with very instructive autopsies. The third ending in recovery. The first has been reported in the *Transactions* of the Am. Otol. Soc. (vol. v., part 1, p. 13). A man of twenty-six had an acute otitis media chiefly in the attic; headache, nausea, dizziness, and some stupor. He came to the hospital a month after the beginning of the trouble, very feeble, with the expression of intense suffering. The dizziness increased and the mastoid was swollen and tender. Three days later I chiselled an elliptical opening into the bone, fully ¹ inch deep. Finding no pus, I desisted. Four days later there was free suppuration from the opening and the ear. Temporary relief. Then intense headache, vomiting, chills. Temp. rose from 99° to 105°. Death 23 days after operation. *Autopsy*: Attic full of pus. Purulent lepto-meningitis of the left temporal lobe and the lateral ventricle. Collection of pus on inner side of mastoid, especially in and above the foramen lacerum, separated from the operative wound by a thin layer of healthy bone.

The other, very instructive case was published by me *in extenso* in the year 1883.¹ A very brief abstract is as follows.

Healthy man, æt. thirty-nine, after sea-bathing, August 6, 1882, got pain in the right ear, forehead, and occiput. Drum-head red, upper part bulging. No fever. Mastoid free from any abnormality. Paracentesis, copious discharge; pain relieved. Pain returned in a few weeks, most in right occipital region, where, four weeks later, swelling and fluctuation were discovered. I made an incision through the scalp 6 *cm* behind and 2 *cm* above the level of the ear canal, down to the bone, and liberated a considerable quantity of creamy, inoffensive pus. In the bone, the surface of which in an area of

¹ ARCH. OF OTOLGY, xii., p. 44.

2.5 *cm* in diameter was denuded but smooth, there was an opening of 4 *mm* in diameter extending into the cranial cavity, as could be ascertained with a probe. A silver drainage tube was inserted, reaching through the fistula into the cranial cavity. For two months his condition was variable, at times he felt well, at others when the discharge through the tube was scant, he had headache, chiefly frontal, nausea, fainting spells, chills, cold and hot perspirations. His pulse varied from 84 to 104, his temperature from 38° C. to 38.8°. At last neuro-retinitis, delirium, convulsive twitchings, and coma set in. Death, January 11, 1883, five months after onset of disease. *Autopsy*: Outer mastoid region healthy, inner table wanting, cavity filled with pus which spread along outer surface of lateral sinus to fistula in bone. Abscess in cerebellum, pus greenish. The temporal bone, removed and carefully examined, showed an unusually narrow communication between mastoid and tympanum.

If in time I had opened the mastoid and secured a free escape of the pus, the life of that man would surely have been saved; but at that time I was not so prepared as I am now to operate on a bone when no outward abnormality could be found.

The third case is a counterpart to this, but *terminated in recovery*.

Mr. R. H. Pettus, colored, æt. twenty-five, had been treated at the Dispensary of the N. Y. Ophthalmic and Aural Institute, by Dr. C. H. May, who on November 27, 1890, opened a postaural abscess and dilated the fistulous opening in the bone, establishing communication with the ear. Admitted to the hospital, the patient came under my care. I will state forthwith that during all his illness, he had almost no fever, and, besides occasional moderate headache, no subjective symptoms. During the first 2 weeks there was free discharge through the ear and the drainage tube in the mastoid. Then the discharge from the latter disappeared, but a fluctuating swelling of the scalp developed 5 *cm* behind and 2 *cm* above the level of the ear canal, in the same locality as in the former case. It was either in or near the lambdoid suture. I incised it, April 16th, and liberated a quantity of pus. Through the integument of 2 *cm* in thickness, the probe passed through

a bone fistula 2 *cm* deeper, finding a membranous, yielding resistance, evidently the dura mater. A drainage tube introduced into the fistula steadily let out a great deal of pus. It was changed two or three times a day. At the beginning of May, there was again some swelling of the mastoid, especially at the tip, which on poulticing disappeared. Patient felt uncomfortable, but had no headache. Toward the end of May, the discharge from the ear and the tube in the occipital bone began to diminish. May 26th, the drainage tube was omitted, the patient left the hospital, and was not seen again until 2 years later, when he came to the dispensary, well and hearty, bringing another patient. He had resumed his former occupation as a porter in a Pullman railway car, and had had no more discomfort from his ear. His drumhead was entire, a little dull, the mastoid showed a linear, the occipital bone an irregular indrawn scar. His hearing was normal.

Remembering the preceding case, I had no doubt that there had been in this one an extra-dural collection of pus, fed from the mastoid cavity perforated on the inner side, travelling along the transverse sulcus to the lambda suture, where it pierced the bone (through an emissary vein?). It might have been proper to enlarge and keep open the fistula in the outer table of the mastoid, but as the free discharge from the ear itself continued uninterruptedly, and there was almost a total absence of grave symptoms, I thought I might leave well enough alone. The happy termination seems to support this theory, but after more extended study and experience in such diseases, I probably shall, in similar cases, lay the mastoid cavity largely open and see that all the pus secreted there flows out, and none into the cranial cavity. Nature has many possibilities, but in the affection under consideration the fortunate outlet of extra-meningeal pus through a new aperture in the cranial bones appears far less frequent than the development of meningitis, thrombophlebitis, and brain abscess. HESSLER, of Halle, in a very instructive paper on the subject,¹ has collected and tabulated 53 cases of this affection (the one published by me in 1883 not only in the ARCH. OF OTOL., but also its German edition,

¹ *Arch. f. Ohrenh.*, xxvii., part 2, p. 87, 1892.

the *Zeitsch. f. Ohrenheilk.*, Bd. xiii., p. 39, has been overlooked), of which 17 cases recovered after an operation. Without an operation, the prognosis thus far had proved fatal in all cases.

Encephalic Abscess

is of frequent occurrence. In about two thirds of the cases the abscess is in the temporo-sphenoidal lobe, in about one fourth in the cerebellum, in 3 or 4 per cent. in both at the same time, exceptionally in the frontal or occipital lobe, in the pons Varolii, the cerebellar peduncles, and the centrum ovale. Otitic abscess of the brain is produced almost always by chronic cases; the symptoms are mostly little characteristic, so that the diagnosis is very difficult. It is produced by lesions of the most different parts of the ear: as a rule, the lesions of the tympanic cavity proper and the attic produce abscess in the temporo-sphenoidal lobe; those of the mastoid, cerebellar abscess. Abscess is usually not the only brain lesion; pachy- and leptomeningitis and sinus-thrombosis are found combined with it, mostly as the consequence of the abscess, not infrequently as its cause—for instance, extra-dural accumulation of pus. The subject has been so extensively discussed during the last years in periodicals and monographs¹ that I abstain from dilating on it here. I beg to refer only to a case of mine which I published *in extenso* in vol. xxi. of the ARCH. OF OTOL., p. 239, 1892. It was a case of attic disease, perforation at the medial side of the tip, mastoiditis purulenta, purulent thrombosis of most of the sinuses and both internal jugular veins, an abscess in the temporo-sphenoidal lobe, another one in the cerebellum, and finally meningitis. I opened the mastoid with temporary relief, and later the cranial cavity in two places, laying the lateral sinus, the cerebellum, and the temporo-sphenoidal lobe bare. Finding no epidural collection of pus, and the dura mater and adjacent layers of the

¹ I may mention the communications of Truckenbrod, Barr, Pritchard, and especially the exhaustive paper by Heimann in these ARCHIVES, v. Bergmann's classical monograph, a readable paper by Piqué and Février in the December number of the *Ann. de l'Oreille*, etc., 1892, and an excellent paper by Frank Allport in the *Journ. Am. Med. Ass.*, October 15 to December 24, 1892.

brain substance healthy, I went no further, because the patient was utterly exhausted. She soon died, and the autopsy showed that the abscesses were at the places where I had opened the skull. The permission to the operation had been given much later than I proposed it. I have spoken in that publication at length on the operation of opening the skull, diagnostic points, and rules for guidance, and so has Dr. Allport in his exhaustive paper, which is based on the statistics of 169 cases of purulent brain deposits, phlebitis and thrombosis following ear disease. He has admitted no case to his synopsis in which the diagnosis was not verified by an autopsy or an operation. How errors of diagnosis are possible, even if the symptoms point with the greatest probability to a brain lesion caused by chronic purulent otitis, is evidenced by a case which I observed last year and reported at the Am. Otological Society,¹ and of which I beg to give an abstract.

A strong man of apparently healthy constitution who had had discharge from his right ear for three years. It had stopped a week before I was consulted. Headache, increase of temperature (101° to 102.25°), with normal pulse, drowsiness, movements of hands, stupor, incoherent and difficult speech, and delirium had set in. His family physician diagnosticated partial meningitis; two eminent neurologists diagnosticated cerebral abscess *ex otitide* and advised craniotomy, so did I when I was called. I was asked to perform the operation. A small quantity of offensive pus was still in the ear. There was no painful place at the head, nor any tenderness or swelling of the mastoid. Percussion not painful. My plan in operating was to remove the outer table of the mastoid, penetrate into the antrum and the tympanic and cranial cavities. The mastoid was sclerosed. Under the outer cortex the bone tissue was blackened in patches and contained a few small cavities, filled with thin pus. Chiselling more deeply, the bone substance appeared healthy, hard, ivory-like, uninterruptedly compact, free from caries and necrosis; it gave no clue in which way the morbid process might have entered the cranial cavity. When the wound was 2 *cm* deep, I proceeded no farther. The patient died three days later. The autopsy showed extensive

¹ *Transactions*, 1892.

tubercular disease of the lungs, pleura, and pericardium, and tubercular meningitis which had no connection with the ear.

Sinus Thrombosis.

The symptoms of this affection are well known: accelerated pulse, high and sometimes rapidly falling and rising temperature, chills, headache, stupor, loss of appetite, constipation. The diagnosis is made sure when besides these symptoms a cord-like or round swelling appears medially and in front of the upper part of the sterno-mastoid muscle, which is hard and painful on pressure and frequently terminates abruptly about 3 *cm* below the jaw. This is the place where the external facial vein empties into the internal jugular. The stream of healthy blood from the facial seems to keep free the calibre in the lower portion of the jugular. The singular phenomenon, so remarkable in the case published by me last year (*ARCH. OF OTOL.* xxi., p. 239), that the swelling under the lower jaw is intermittent, is explained by the same anatomical fact that the stream from the external facial syphons out the liquefied thrombus in the upper portion of the internal jugular. This portion is then filled again with coagulating blood which in its turn is liquefied and carried off again. When the thrombosis extends into the sinuses of the other side, the same phenomenon may occur in the other internal jugular and be very misleading as to diagnosis, simulating a swollen lymphatic gland. All this occurred in the case just referred to. In the same way the protrusion of the eyeball, of which there are a number of cases on record, in earlier as well as in recent literature, is explained by the thrombosis of the cavernous sinus extending into the ophthalmic vein and its abundant retrobulbar ramifications.

For otitic thrombosis of the cerebral sinuses ligation and cleaning out of the internal jugular vein (the external facial has to be ligated too) and the lateral sinuses have been performed by English and American surgeons (Balance, McEwen, Dean, Barker, Abbe, etc.), and in the successful cases the saving of life has been attributed to the operations on the veins. It is known, however, that sinus

thrombosis and pyæmia may spontaneously be recovered from, and in the following case, which was as clear a case of thrombosis and pyæmia as any, the recovery followed upon an extensive operation on the mastoid without interference with the veins and sinuses.

Marked case of sinus thrombosis and pyæmia cured by an extensive opening of the mastoid.

Mrs. Mary Webster, æt. thirty-three, 165 West 115th Street, New York City, had an earache on the left side after a nasal operation early in May, 1892. Two weeks later the ear discharged. During the next seven weeks she felt better and the otorrhœa gradually diminished, but on July 14th the discharge stopped and violent headache, pain in and behind the ear, set in. The ear canal was swollen, mostly anteriorly. Shrapnell's membrane was bulging. Pain on pressure on tip and below mastoid. Dr. Holden made a paracentesis of the drum which did not liberate pus. She felt relieved for a few days, but on July 22d she came to the Dispensary of the New York Ophthalmic and Aural Institute, complaining of severe pains in ear and head, and vomiting. Pulse 98, temp. 102°. I admitted her to the hospital and made a large paracentesis of the bulging drumhead with the galvano-cautery. She felt some relief for a few days. July 26th her condition was very bad. Her pulse was 108, her temp. 105°. She had violent headache, nausea, dizziness, and stupor. She coughed and her respiration was accelerated. The ear discharged but little, the mastoid was normal, as far as the external aspect was concerned. It was not painful on pressure; percussion of skull showed no sensitive place. The skin under the ear, however, and the tissue in the retromaxillary fossa were swollen, and along the anterior border of the sterno-mastoid muscle there was a hard painful cord, terminating somewhat abruptly about 3 cm under the angle of the lower jaw, where the internal jugular (the hard cord) connects with the facial. The left side of the back of the chest was in places duller than the right, the fremitus vocalis more distinct. There was choked disc in both eyes. I told her brother that, his sister was in danger of life, and if anything could still save her it was an immediate operation. He gave his consent and without difficulty persuaded his sister to give hers. I made an incision 5 cm long, down to the bone and close to and above the auricle. In the usual way I opened the mastoid with a chisel and extended the

opening with a strong sharp spoon forward and inward. The outer table of the mastoid was healthy. A large quantity of thick pus was in the antrum and cells. I removed a great deal of brittle bone and granulation tissue, until the bony wall felt hard in every direction. The length of this artificial canal which everywhere was bordered by bone, was nearly 5 *cm.* It must, therefore, have penetrated deeply into the petrous portion of the temporal. There was no twitching of the face during the operation, nor any paralysis later. Having in this way thoroughly destroyed the source of the suppuration by cleaning out the cavity, I desisted from going farther, remembering that purulent sinus thrombosis and pyæmia may be recovered from when the source of the suppuration is stopped. The patient soon rallied from the operation. The wound was cleansed and afterwards plugged with corrosive sublimate gauze. It was syringed with clear water once or twice daily. There was no more suppuration, either from the wound, or from the ear. She improved from day to day. The choked disc disappeared in two weeks, the swelling in the retromaxillary fossa in about ten days, but the dulness and the increased fremitus in the left lung much more slowly. The patient was discharged Sept. 2, 1892. Her hearing was $h = \frac{1}{2}$, $v = \frac{2}{3}$ —. She was examined again Oct. 4, 1892. With the exception of occasional slight attacks of nausea and occipital pain she has felt well. The wound is closed, the scar considerably drawn in, the drumhead entire, the handle of the malleus and the upper folds are still red, the hearing is good, namely $h = \frac{3}{4}$, $v = \frac{2}{3}$, just as acute as on the other side. Her pale, yellowish color is gradually disappearing and she may be pronounced cured. She was seen again in February, 1893, perfectly well in every respect.

I acted in this case on the principle which I have advocated and followed for years: first and above all remove the source of the suppuration, and then act according to the indications present, or if they are not clear wait for further developments.

I abstain from going into the operative technique of opening the mastoid and the skull, because that is generally known and well described in the text-books of otology and surgery. My purpose in this paper has been to show the most dangerous consequences of inflammatory ear diseases, to dwell on the importance of an early appreciation of these diseases and

to draw attention to valuable diagnostic points, in the deep conviction that, if anywhere prophylaxis is more useful than cure, it is in otitic brain disease.

I have dwelt on the early recognition and treatment of those ear affections that have a tendency, if neglected, to develop brain disease, and I may be pardoned for having repeated many observations that are generally known but which, for the sake of completeness in the presentation of my subject, I did not care to omit ; other parts, I presume, may be read with interest even by the expert otologist, in particular the observations on extradural collections of pus and on sinus thrombosis. My belief is that the aural surgeon should not only be perfectly familiar with the diagnosis and surgical treatment of otitic brain disease, but also be competent and prepared to perform the necessary operations himself.

AN ATTEMPT TO REPLACE AN AURICLE BITTEN OFF IN CHILDHOOD.

By B. ALEX. RANDALL, PHILADELPHIA.

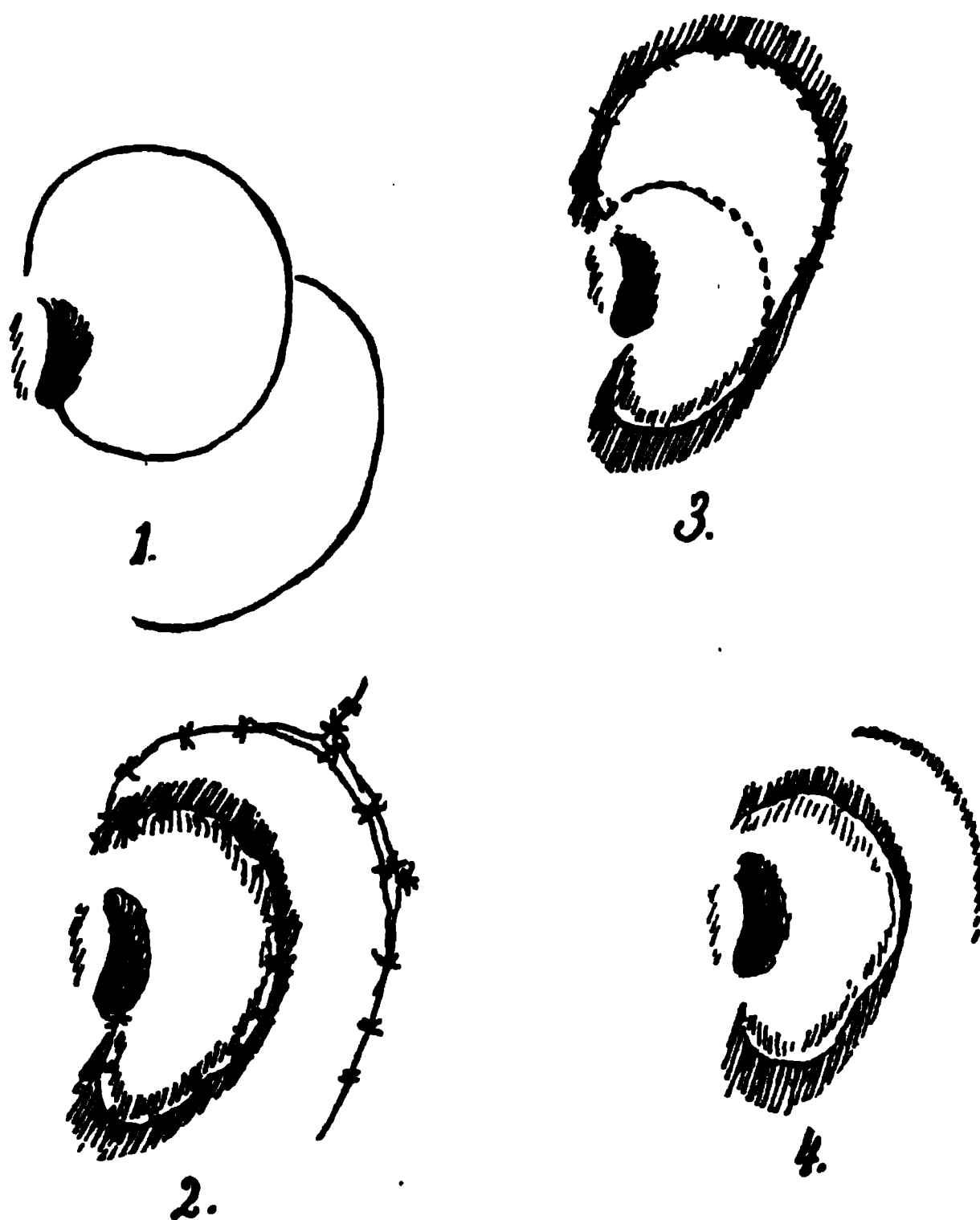
(With 4 drawings.)

Martin —, laborer, Irish, æt. thirty, came to the University Hospital seeking relief from deformity through lack of the left auricle. With misplaced confidence he had "lent his ear" to a companion of his youth, and the dishonest hog had totally made away with it. The hair was arranged to cover the region somewhat; but the lack constituted a particularly hideous deformity, enhanced by the large size of the right auricle. Nothing but the cartilaginous meatus and the tragus remained. A long scar, as though from a burn, extended down along the ramus of the jaw in front; but the hairless area of skin over the mastoid was healthy and ample, so a plastic attempt at building a new auricle seemed justified, although the only cartilaginous tissue available for a flap was that of the auditory canal, and without such support any semblance of an auricle seemed impossible.

Accordingly, on April 4th, under ether, the largest flap possible was cut from the back wall of the auditory canal and turned upward, while the large crescent of hairless skin covering the mastoid and above the canal was dissected up and turned forward to form the back of the new auricle (Fig. 1), its free edge being stitched to the periosteal tissues just behind the meatus. The bare area thus left was reduced in size by stitches in two radiate lines and largely covered by a curved flap extending all the way to the uppermost part of the wound (Fig. 2). A dry dressing was applied over all, with a tampon in the auditory canal to support the displaced cartilaginous tissue and to assist in holding in place the flap forming

the back wall of the canal. Healing was kind and uneventful, and little shrinkage appeared in the three following weeks. All of the stitches had then been removed, the posterior wound was healed and the small auricle-like mass had a good lobule, but hardly rose above the meatus and remained in pitiful contrast to the huge auricle of the other side.

As the patient was pleased with the beginning and anxious to



have further improvement, a second operation was tried. He declined to furnish the needed new tissue from the redundant right auricle, which would probably have been improved by the excision of a liberal wedge, so the cartilage and skin tissues were taken from the ear of a well grown gray rabbit. The part of the new auricle doing duty for helix was unrolled to form, with its whole extent, the front of the future helix, and a graft, obtained by dissecting off the furry outer skin of the rabbit's ear and excising a

nearly circular piece of cartilage and inner skin 40 millimetres in diameter, was placed with its cutaneous surface next to the head to form the hinder surface. This was stitched along the periphery, skin to skin (Fig. 3), and the whole convexity and its inner edge secured partly by deep stitches and partly by a pledget, held by a thread passed through the base of the auricle and tied in front over a roll of lint. A dry iodoform dressing was applied with carefully adjusted pressure. The union of the rabbit skin to the human was prompt and generally perfect; but a little purulent secretion stained the dressing at the rare removals, and the graft shrank steadily away until the condition was almost precisely that before the second operation. Healing was complete and the ear could be left without dressing in four weeks—when the condition was as in the illustration, Fig. 4,—the little rudimentary auricle tending more to overhang the meatus than before, perhaps as the temporary result of the displaced pressure of his last bandage. The cartilaginous tissue derived from the auditory canal seemed to undergo no shrinkage, but was drawn somewhat down into its original place—otherwise the result of the first operation was persistent. The large scar back of the ear was hardly visible except for its pinkish color, but comes out more distinctly in a photograph than does the more conspicuous old lesions in front. The hearing remained at all times practically perfect.

The patient was in excellent health and the conditions generally propitious, so the result probably fairly shows the limitations of plastic surgery under such circumstances; yet it may furnish suggestions to others for some more successful measures.

A CASE OF EPITHELIOMA OF THE AURICLE.

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EPITHELIOMA of the auricle is comparatively uncommon, although cases have been observed by Stocken,¹ Schubert,² Kipp,³ Habermann,⁴ Moos,⁵ Marian,⁶ Burnett,⁷ Kretschmann,⁸ De Rossi,⁹ Seely,¹⁰ Buck,¹¹ and Guermontprez and Cocheril,¹²

I take the liberty of reporting in detail the history of a case of this affection which I operated upon some months since.

Mrs. R., æt. sixty-three, consulted me about five months ago, on account of a discharge from the left ear, which had been present for about six weeks. For the past eight weeks there had been constant and increasing pain in the left ear, gradually extending until it involved the entire left side of the face. Manipulation of the auricle increased the pain, especially when pressure was exerted in front of the tragus. The præauricular region had been swollen for about four or five weeks, and at this time, according to the patient, a mass had been removed from the external canal by means of the curette.

¹ *Archiv für Ohrenheilk.*, vol. xx., p. 270.

² *Ibid.*, vol. xxx., p. 49.

³ *Transactions of the Amer. Otol. Society*, vol. iii., pt. 3.

⁴ *Archiv für Ohrenheilk.*, vol. xviii., p. 76.

⁵ *Zeitschr. für Ohrenheilk.*, vol. xiii., p. 66.

⁶ *Archiv für Ohrenheilk.*, vol. xxii., p. 212.

⁷ *A Treatise on the Ear*, Philadelphia, 1884, p. 234.

⁸ *Archiv für Ohrenheilk.*, vol. xxiii., p. 237.

⁹ *Archiv für Ohrenheilk.*, vol. xxii., p. 283.

¹⁰ *Transactions of the Amer. Otol. Society*, 1883, p. 118.

¹¹ *A Manual of Diseases of the Ear*, N. Y., 1889, p. 51.

¹² *Rev. de Laryngol.*, 1892, vol. xii., p. 665.

Examination revealed the surface of the meatus almost completely closed by a firm mass arising from the base of the tragus, upon its internal surface, and involving to some extent the inferior and posterior margins of the meatus. The surface of the growth was ulcerated over a small central area, and was bathed with an offensive discharge, which filled the external auditory meatus. Careful manipulation permitted the introduction of a small speculum, and although the drum membrane could be but imperfectly inspected, the examination satisfied me that no important middle-ear complication was present. The bony canal was perfectly free, and the growth seemed limited to the bony orifice of the meatus, involving chiefly the tragus. Pressure in front of the tragus revealed that this structure was infiltrated throughout its entire thickness, and inspection showed a distinct fulness in this region. There were no enlarged glands, and the mass was entirely movable.

Although the tumor had a decidedly malignant look, the history was so short that it was decided to keep the patient under observation for a few weeks, bearing in mind that a suppurating sebaceous cyst in this region, with secondary perichondritis, might give rise to the local condition. At the end of two weeks the tumor was decidedly larger, and had extended so as to involve the auricle as far as the base of the antitragus, while in the præauricular region the mass had greatly increased in size; the superficial ulceration was also extending rapidly. With the snare, a small fragment was removed, and the microscope revealed the structure characteristic of epithelioma. As the general condition of the patient was daily becoming poorer on account of the severe pain, immediate operation was advised, although the possibility of a recurrence was fully explained.

Operation: The usual antiseptic precautions were observed in preparing the field of operation, and during the execution of the procedure. An incision was made from the superior border of the tragus, forward and downward through the tissues of the cheek, taking care that it should lie well outside the line of induration. The posterior portion of the incision was rapidly deepened until it extended into the meatus, care being taken to avoid opening the temporo-maxillary articulation. From the termination of this horizontal incision, a second was made, extending downward and backward to the insertion of the lobule. The neoplasm was thus included between these incisions, and was completely removed

by careful dissection. A small portion of the parotid gland lying in the lower portion of the wound was also removed, though possibly not diseased. Care was also taken that the section of the cartilaginous meatus should be made through perfectly sound tissue.

As the general condition of the patient did not warrant a prolonged plastic operation, the wound could not be closed completely, though by dissecting up the integument along the two transverse incisions the margins could be approximated throughout two thirds of the extent. When this was done, the lower angle of the wound gaped widely; in order to fill up this space, the tip of the lobule was separated from the auricle, and the flap thus formed was split; in this way a cutaneous flap of considerable size was formed, which when turned forward into the wound, filled the lower angle completely. By dissecting out the cartilage of the antitragus and folding the remnant of the lobule forward and upward, so as to bring the raw surfaces in apposition, a fairly well proportioned auricle remained. The margin of the cartilaginous canal was then secured to the raw surface in front of the meatus by a strong silk suture; this could only be done by stretching the tissues to such a degree that it seemed certain that the suture must cut through in a few hours, but in the hope that the support afforded for this short time might reduce the possibilities of a cicatricial narrowing of the meatus, it was decided to leave the suture in position. There now remained uncovered, an area about $\frac{3}{4}$ " \times $\frac{1}{2}$ " below and in front of the meatus, and it was decided to allow this to heal by granulation. The wound was dressed with iodoform and bichloride gauze. The recovery was uneventful, healing took place partially by first intention, but in places there was suppuration. The raw surface healed perfectly by granulation, and the auditory canal preserved its normal calibre. There is no evidence of recurrence, and the patient's general condition is much improved.

The growth removed was examined by Dr. Weeks, and found to be an epithelioma.

One of the most interesting features of this case is the rapidity with which the growth developed, requiring removal in about two months after its appearance. Of the cases reported in medical literature Green's¹ case developed

¹ *Transactions of the American Otological Society*, 1870, p. 62.

in eight months, apparently as the sequel of a chronic eczema, while Demarquay¹ and Velpeau² cite instances in which the neoplasm appeared first as a simple wart upon the auricle, transformation into a malignant growth resulting apparently from violence, or the application of irritants. Velpeau's case is of special interest, as the growth was upon the tragus, and had attained such dimensions as to demand removal in two months from the time it was first noticed.

Glandular enlargement seems to be an infrequent complication of malignant tumors in this location, the only instances with which I am acquainted being the one reported by De Rossi³ and one case in my own practice. In the former case, both the parotid and cervical glands were involved; in the latter, only the cervical. In both instances a complete cure followed the removal of the neoplasm and the infiltrated glands.

It would seem, from the study of reported cases, that malignant disease of the external ear is much more amenable to operative interference than the same affection in other portions of the body, and, that if the growth is completely excised, before the involvement of surrounding parts renders this impossible, there is every reason to hope for a complete cure.

¹ *Gaz. des Hôpitaux*, 1869.

² *Ibid.*, 1864, p. 106.

³ *Archiv für Ohrenheilkunde*, vol. xxii., p. 283.

THE HEARING POWER IN DEAF-MUTES; BEING
THE RESULTS OF THE EXAMINATION
OF 175 DEAF-MUTE CHILDREN.

By JAMES KERR LOVE, M.D.,

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FOR THE EDUCATION OF THE DEAF.

DEAFNESS is almost always relative. A man may be deaf to the tick of his watch but hear conversation; or he may hear nothing of conversation and hear a church bell, or a clap of thunder. Most of us have a little hearing power in reserve, a little to spare. We may become "dull" to a slight extent, and if the dulness be not accompanied by any painful symptom we may be ignorant of its existence till some accident occur to test us. Then we find that the watch is not heard at the full distance; but as long as we can get along without difficulty in business, or in the parlor, or at church, we do not call ourselves deaf.

Moderate degrees of deafness are always measurable. The watch and the various acoumeters enable us to state, with regard to at least one sound of given quality and pitch, the hearing power in any case. A watch heard at 36 inches by a sound ear may be heard at 6 inches by a person hard of hearing, and we are able to state that for that watch the person has lost 50 per cent. of his hearing, or that his hearing is .5, or we may represent his hearing by the fraction $\frac{6}{36}$, always remembering that when thus represented by a vulgar fraction the case looks worse than it really is, for sound diminishes in intensity inversely as the square of the distance. The watch and the acoumeters are accurate as far as they go, but they do not go very far. A deaf person may not hear the watch at all, even in contact with his ear,

and yet hear ordinary conversation quite well, or he may hear the watch at several inches and have much difficulty with conversation. Then watches and acoumeters tell us nothing in the case of very deaf people; they are all unheard. So that, for the very deaf, we have no hearing tests, and, what is worse, we have no accurate nomenclature. When deafness is extreme in early life, or if great deafness be congenital, muteness accompanies it, and we begin to talk of the deaf and dumb. It is true that dumbness is a result of a certain degree of hardness of hearing, that amount of hardness of hearing which makes conversation difficult or impossible, but it is not a necessary result of such hardness. If such deafness occur in the adult, he will never forget the art of speech, and will never be a deaf-mute. If it occur in the child he may be taught by the oral system, and although stone-deaf he may speak well. So that the term deaf-mute does not express any degree of deafness; it never had a very definite meaning, and the oral system has robbed it of some of the meaning it once had. And yet there is a degree of hardness of hearing which makes the acquisition of speech difficult or impossible by the ordinary methods, and which usually results in the loss of recently acquired speech; "Surdism" is the name I would apply to this degree of deafness. It is not measurable by any test we have; but it is sufficiently well defined by this: that it makes the acquisition of speech difficult or impossible, and that by no ordinary method can one communicate with its victim through his auditory nerve.

No acoumeter for this degree of deafness has been devised, and perhaps such an instrument, if invented, would not be of much value. The important query about the very deaf is: Can he distinguish the various sounds of the human voice? If he cannot, he will never speak unless he can make his eyes do duty for his dull ears. If he can, even with difficulty, you may confer on him, or preserve for him, the gift of articulate speech.

In testing the hearing of the very deaf, the victims of surdism, many instruments have been used, and the human voice has almost always been employed. Among instru-

ments—watches, clocks, tuning-forks, and bells may be mentioned. A good synopsis of the results obtained by these tests will be found in Hartmann's book on deaf-mutism, and may be briefly repeated here.

Toynbee classed deaf-mutes under seven different heads. He examined 411 cases.

Totally deaf.....	245
Clapping of hands heard by....	14
Loud shouting heard by.....	51
Loud voice close to ear heard by.....	50
Could distinguish and repeat vowels.....	44
Could repeat short words.....	6
Could repeat short sentences.....	1
	<hr/>
	411

Amongst these 411 were 313 born deaf, of whom 141 heard certain tones, and 41 repeated vowels pronounced for them. Of the remaining 98 with acquired deafness, 73 were totally deaf, and 25 heard certain tones.

Kramer examined 45 deaf-mutes, and classed them thus:

	Congenital.	Acquired.
Completely deaf.....	10	13
Uncertain hearing for sound.....	5	3
Uncertain hearing for vowels....	7	1
Distinct hearing for vowels.....	2	—
Distinct hearing for all words they have been taught....	2	1
Distinct hearing for many words not known to them.....	1	—
	<hr/>	<hr/>
	27	18

Hartmann examined 204 deaf-mutes at the Berlin Institution, and classed them thus:

	Congenital.	Acquired.	Uncertain.
Words heard.....	4	12	—
Vowels heard.....	6	12	—
Sounds heard.....	17	39	1
Totally deaf.....	24	86	3
	<hr/>	<hr/>	<hr/>
	51	149	4

Hartmann classes Kramer's examinations and those at the two Baden institutions of Nursburg and Gerlachstein along with his own, and concludes as follows:

“ More than one half (60.2 per cent.) of all deaf-mutes are totally deaf. A fourth have hearing for sounds, a seventh hear vowels and words. The difference in the hearing power of congenital deaf-mutes, and of those who have acquired deafness, shows itself principally in the fact that, amongst the latter class the cases of total deafness are far more numerous (68.4 per cent.) than amongst the former (44.2 per cent.).”

De Rossi of Rome examined the hearing of deaf-mutes with speech (through the speaking-tube), and with the tuning-fork (vibrating in the air and on the cranial bones), and with Helmholtz's resonator. He thus tested 70 cases, and states the result as follows :

Speech heard by.....	27
Watch heard by.....	4
Tuning-fork vibrating in air heard by.....	39
	<hr/>
	70

In contact with the cranial bones, the tuning-fork was perceived by almost all the deaf-mutes, and there were only 11 who had no perception. He found only 3 cases of total deafness. More recently (in 1884) St. John Roosa of New York examined 147 deaf-mutes. In 1867 he and Dr. George Beard examined 296 cases. The latter set of cases gave but meagre results according to Roosa, the former were examined chiefly for the purpose of ascertaining the locality of the lesion causing the deafness. Roosa used the tuning-fork alone in his tests. I shall notice his work at greater length in a future paper on this subject.

In testing the children at the Glasgow Institution I used :

A large bell,
A large tuning-fork,
Politzer's acoumeter,
The human voice.

Of these, the last is the most valuable test, and where the classification of deaf-mutes for teaching purposes is the object in view, is almost the only test worth using. When testing with the voice, precautions must be taken against

lip-reading. All very deaf people lip-read to some extent, and semi-mutes, even when untaught, lip-read to a very great extent. I pronounced the test words or vowels either behind the child's back, or I covered his eyes with my hand. Next in importance come the bell and fork. For determining the presence or absence of aërial hearing, the bell is the best test. Where any doubt on the point existed the child was made to count the strokes, which were delivered singly and at short intervals. Here too the eyes were covered during the test. The bell used was a large dinner-bell with a spring tongue attached at the junction of the handle and the bell, and so arranged that a violent shake produced a sound of great intensity. A little practice enables the operator to produce sounds of very uniform loudness. In the open air, at the Queen's Park, near Glasgow, the bell could be heard at a distance of nearly 1,000 yards.

The tuning-fork is a large one of about ten inches long, including the handle, and giving a note due to a vibration of 330. Although a powerful fork, it takes a good ear to hear it across an ordinary room by aërial conduction; and yet I met with instances of deaf-mutes who heard this fork at several inches from the ear, and who could not be made to hear the loudest strokes of the bell. But the fork is most useful for testing bone-conduction, and thus indicating the situation of the lesion causing the deafness. Although this is the special value of the tuning-fork, its usefulness is very limited. In very deaf people, when the handle is placed on the forehead, or over the mastoid, the mechanical vibration communicated to the skull is often mistaken for sound, and unless the deaf-mute be very intelligent and well-educated, one cannot be sure that he has heard the sound. He may only have felt the tremor. It requires a deaf-mute of more than the average intelligence to appreciate the tapering off and cessation of a sound produced during a bone-conduction experiment, or to compare the results of experiments on his two ears. These difficulties and the fact that the lesion is probably in many cases one which affects both internal and middle ears, render an exact diagnosis of its seat very difficult, and, in my opinion, only possible in a minority of

cases; the presence or absence of bone-conducting hearing can generally be ascertained, but the amount of it is not usually measurable.

The acoumeter is the least important of the test instruments. I used it in my first hundred cases, mostly educated deaf-mutes, and then gave it up as being of little value, except in the case of semi-mutes with a large remnant of hearing, the amount of which it was desirable to measure accurately. I used it in testing both aërial and bone-conduction hearing. Twelve heard it aërially.

Throughout the whole of the work I was assisted by Mr. W. H. Addison, the principal of the institution, and have to notice not only his great kindness and helpfulness, but his thorough appreciation of the scientific value of the investigation. In all, 175 children were examined. In classifying them a distinction has to be made between the educated and the uneducated. An uneducated deaf-mute cannot describe his experience of a test like this; he has no finger language, his sign language is of the vaguest; he may hear a loud sound quite well, but he cannot imitate it. Unless he have a large residue of hearing and be only a semi-mute,¹ his testing cannot be relied on until he be about a year under tuition. Forty-nine of the whole number of 175 were thus disqualified because of inability to appreciate or reply to the tests. Three were found to hear perfectly, and to have their muteness due to some other cause than deafness. The remaining 123 were thus classified:

I. Stone deaf—hearing neither the bell nor the loudest shouting, nor the tuning-fork sounding in the air.....	9
II. Could hear and more or less distinguish the loudest sounds, <i>e. g.</i> the voice from the bell.....	81
III. Could hear and distinguish the sounds of the human voice.....	33
	<hr/>
	123

¹ In the above, the term semi-mute is to be taken as meaning those whose remaining speech depends on their remaining hearing. They might have been called semi-deaf. The term semi-mute is sometimes applied to a different set of cases: those whose remaining speech is entirely a recollection of what they once heard, although they may now be stone deaf. The acoustic method is of course not applicable to them.

These latter 33 were found to consist of 20 who could hear and distinguish vowels only, 13 who could hear and distinguish vowels, consonants, and some words.

14 cases were quite deaf to the bell. Of these 5 heard the fork by aërial conduction, leaving 9 totally deaf.

Further, of the whole number (123) 80 heard the fork by aërial conduction, and 43 did not. The fork was appreciated by bone-conduction in almost every case, even where no aërial sound was heard. If this sensation were always hearing, and not mere tremor, the number of deaf-mutes who have no hearing would be very small indeed, but I have included as totally deaf all that have no aërial hearing.

From the above it will be inferred that the number of totally deaf is very small (about 7 1-2 per cent.) amongst deaf-mutes. In the second class are found the bulk of deaf-mute children (81 in 123, or about 65 per cent.). These hear and distinguish very loud noises, but cannot differentiate the various sounds of the voice.

The third class contains over a quarter of the children (33 in 123, or about 27 per cent.). Thirteen of these children would hear something of what their fellow-men say to them, if the latter would say it loudly and distinctly enough; that is perhaps too much to expect from the world. But they are seldom or never properly dealt with. Remember that these thirteen children can hear, distinguish, and repeat without lip-reading, consonants and some words. They are not dumb. They are sent to our deaf-mute institutions, and I have the strongest proof that most of these children become much deafer, and very soon quite dumb. Nothing is done to stimulate their auditory apparatus, and it gradually falls asleep, never again to wake. The proof I refer to is this. The thirteen children are drawn from all ages in the Institution, but not equally so. Ten were found among the 75 children admitted during the last two years. Only three existed amongst the 100 children admitted before that period. Nearly two years ago I had evidence of quite a different sort, pointing in the same direction. When first going over the children, I found several quite deaf to consonants and words, and even to vowels, who were described in

the schedule report as having, at the date of admission, a good deal of hearing and a little speech. The schedule is usually filled up under the supervision of a medical man, and is usually correct. The conclusion is inevitable. Semi-mutes become deafer and totally mute, because no effort is made to preserve and develop their remaining hearing. This is not as it should be. Either these children should never enter an institution for the deaf and dumb, or special classes should be made for them, and teaching by the aural or acoustic method adopted. To teach them the finger method is to consign them to a world of silence. The oral method does not meet the case either. It may accustom the child to hear his own voice by bone-conduction, but it does very little to preserve his hearing for the sounds of the world around him. If the remaining hearing is to be preserved and developed, the stimulus must reach the auditory nerve by the ordinary channel, and the stimulus must consist of the distinctly articulated words of a teacher, and not merely of the imperfect imitations of the pupil himself.

Anticipating the subject of the causes of deaf-mutism, it may here be noticed, that of the 9 totally deaf, 7 were born deaf, and 2 were born hearing (as reported in the schedules). Of the 33 who distinguished voice sounds, 8 are said to have been born deaf, 20 born hearing, and regarding the remaining 5, doubt is expressed or information is not given.

Comparing these results and those of other observers, I find myself in accord with De Rossi in regard to the main points raised.

1. Total deafness is very rare among deaf-mutes. For aërial sounds it is not greater than 7 or 8 per cent., for bone-conduction sounds, even less.

2. Hearing for speech is pretty common. It exists to a utilizable extent in 25 or 27 per cent. of deaf-mutes, and from 10 to 15 per cent. are only semi-mute. Under the finger system of teaching these semi-mutes become rapidly deafer, and soon totally dumb. The oral system may do something to prevent this, but it can only be properly dealt with by the acoustic method.

3. Cranial conduction exists in almost all cases, and a large vibrating tuning-fork is almost always heard in this way. It is also heard in the majority of cases by aërial conduction. In a small number of cases can such sounds as those of a watch, or Politzer's acoumeter be heard. On the other hand, I am much at variance with Toynbee and Hartmann, who found most deaf-mutes totally deaf. Hartmann's further statement, that total deafness is commoner in acquired than congenital deafness, does not coincide with my experience. Most of those examined by me and found to have hearing for vowels, consonants, and words, were cases of acquired deafness. Only two of my nine cases of total deafness were said to have been born hearing.

I cannot altogether explain these differences. The absence of a standard test and a uniform method may account for them, but their existence makes the detailed description of instruments and methods given in this paper, very important.

THE BEST BEND OF SHAFT AND HANDLE IN INSTRUMENTS FOR OPERATION IN THE DEPTH OF THE EAR CANAL.

By ROBERT BARCLAY, A.M., M.D., ST. LOUIS, MO.

(*With a wood-engraving.*)

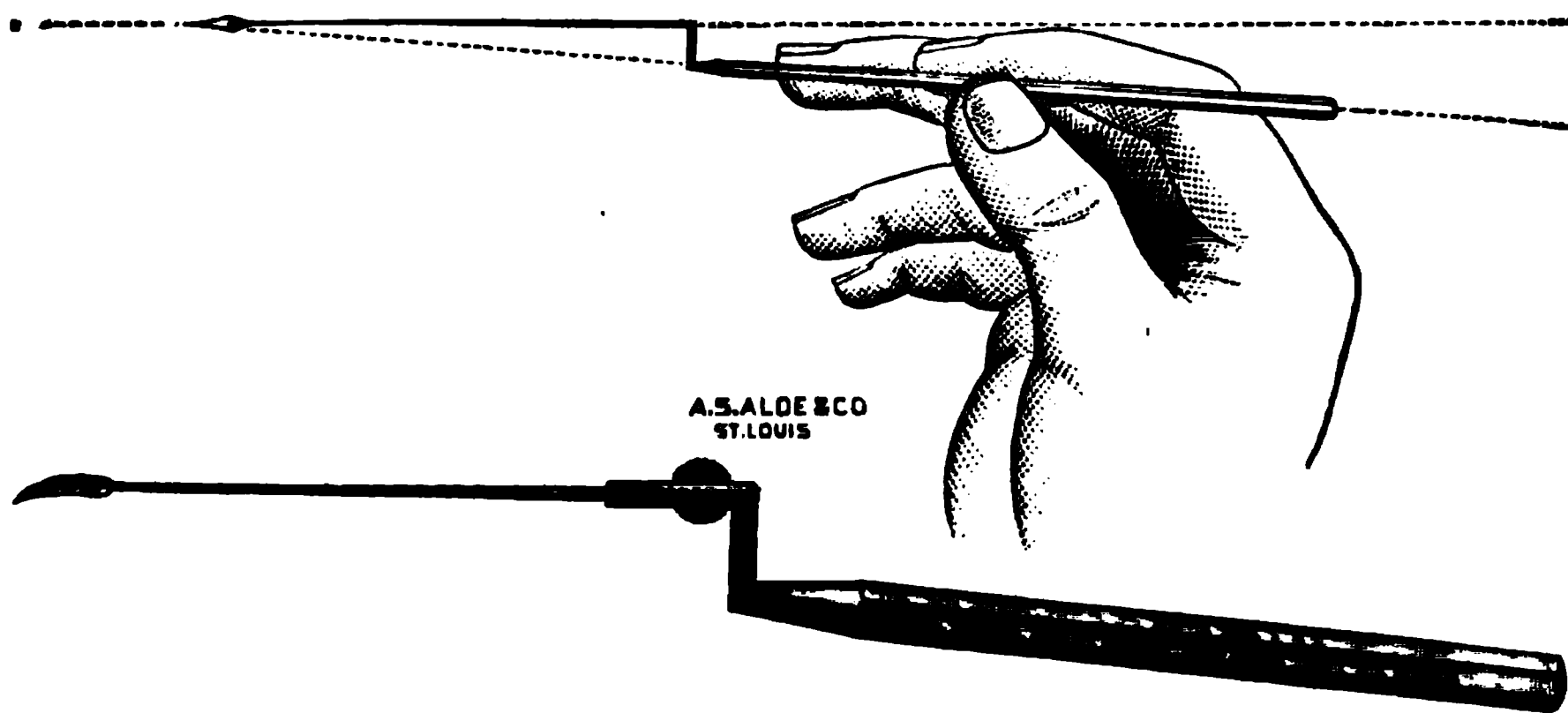
The necessity for the most delicate and accurate manipulation of instruments in operations upon the deeper external auditory canal, drum-head, and tympanic structures, and the extreme difficulty, if not impossibility, of satisfying it with aural instruments having shaft and handle of the existent patterns,—straight, bent (as at 110°), and twice-bent (as in the double-curette),—which are fundamentally unsuitable for this service, have provoked an attempt to devise a shaft and handle so proportioned as to combine the desirable features of those already in use, without their respective defects and faults.

The result is the instrument (see Fig.) described below, which affords a maximum of vision, of illumination, of mechanical effectiveness, of manipulative convenience and manual control, of economy of expense and space, and of adaptability to surgical instruments for narrow cavities.

The essential features of the new instrument are these: the aluminium handle is of dimensions and weight most favorable to delicate and accurate manipulation. Its long axis passes directly through *the operative extremity of the operating shaft*, which is, therefore, as in a straight instrument, *wholly under control*, and can be made to operate at will, *in any direction*, rectilinearly or curvilinearly, or to rotate without displacement.

The handle is joined to the operating shaft by a lateral shaft, of length only sufficient to permit, in operation, the greatest illumination and vision along and beyond the operating shaft. For an operator whose finger-tips are uncommonly slender, or who handles the instrument with his finger-tips, this lateral shaft may with advantage be constructed somewhat shorter than usual.

The operating shaft is of the smallest dimensions permissible under the operative requirements, and is at right angles to the lateral shaft, thereby enabling the operator to hold the handle as near as possible to his work and to operate with a finger rest. If the reflection of light from the lateral



shaft be annoying to an operator, he can avoid this by having the lateral shaft made at an *obtuse* angle to the operating shaft, which will deflect the rays of light. This will, however, place the handle somewhat further from the operative extremity.

If desired, the shaft and handle may be constructed separately, and adjustable, with socket and set-screw, so that with one handle may be used, as required, shafts having dissimilar operative extremities. The instrument may be constructed of any size, material, or operative character, as desired, for aural, nasal, or other orificial surgery.

It is hoped that this fundamental modification of our instruments may prove a step in the right direction, and be

suggestive to otologists generally in search of the perfect aural instrument.

For valuable assistance in perfecting the instrument, I desire, in conclusion, to make grateful mention of Messrs. A. S. Aloe & Co., of St. Louis, who have also pledged themselves to construct it—unless ordered otherwise—of material and pattern in strict accordance with my design.

3211 Lucas Ave.

A CASE OF THROMBOSIS OF THE LATERAL SINUS.

By JOHN L. ADAMS, M.D.,

ATTENDING SURGEON TO THE NEW YORK EYE AND EAR INFIRMARY AND TO ST. BARTHOLOMEW'S NIGHT DISPENSARY FOR DISEASES OF THE EYE, EAR, NOSE, AND THROAT.

AMONG the numerous cases which present themselves to the ear specialist there is none perhaps so rare as that of thrombosis of the lateral sinus.

Is this due to the fact that patients do not refer the trouble to the ear or that the diagnosis is difficult?

The limited number of cases heretofore operated on have given us very unsatisfactory if not perplexing symptoms.

The citing of this case may be of interest from the fact that the only pronounced symptoms were those of increased temperature on the side of the head affected, papillitis, and temperature fluctuation.

In my opinion troubles secondary to ear diseases should come into the province of aural surgery, and I think if such were the case mortality from extension of middle-ear affections would be very greatly diminished.

Without encroaching upon the domain of brain surgery, I believe this to be a great field and one which should be more carefully investigated by the aurist.

It has been proved repeatedly that exposing the lateral sinus has been attended in the majority of cases with no evil results. It therefore seems that where sinus thrombosis is to any degree suspected, an exploratory operation should be made, laying bare the sinus in order to discover if the wall is at all affected.

Admitting the feasibility of such an operation, would not

the chances of success be greatly influenced by prompt action before the clot had so permanently formed as to withstand moderate irrigation?

In the case before us the clot extended from near the torcular Herophili to the exit, from the skull, of the jugular vein.

The moderate irrigation used in this case removed only a small portion of the clot (about an inch in length), leaving the remainder as a nidus for septic infection through the now open wound.

Had the patient, on her first visit at my clinic, consented to an exploratory operation, we would probably have found the sinus affected, but not to such an extent as to have involved the adjacent tissues.

Lena K., aged twenty years, on February 2d, first presented herself at my clinic at the New York Eye and Ear Infirmary, complaining of pain in the right ear and right side of the head. Examination showed slight amount of secretion in the external auditory canal, the canal itself being swollen. Membrana tympani thickened and perforated in the posterior inferior quadrant. Tenderness very marked over the mastoid process, slight induration. Temperature 101.2° , pulse 76. Patient considerably prostrated and complained of pain when she moved her head quickly. No swelling or tenderness found in neck below mastoid process. I advised her to come into the hospital immediately and warned her of the dangers of delay. She refused, however, saying she did not think she was sick enough, and preferred to be treated at home by her own physician. Her physician, after treating her a few days, advised her to return. On February 6th she came again to my clinic and was admitted to the hospital. She was at this time supported by her husband and brother, as she was not able to stand alone.

On admission. Previous history :

In November, 1891, had profuse discharge from right ear, which lasted for one week ; this was followed by continuous slight discharge until four weeks ago, when it entirely ceased. Three months ago her hair came out to a great extent on anterior part of scalp and an eruption was at this time noticed on her chest and neck. No sore throat. She was given specific treatment internally, also local medication. Married three years but has had no children. No specific history on husband's side. Always healthy

previous to her marriage, since then has had uterine trouble, (leucorrhœa). Seventeen days ago began to have headaches. Ten days ago the right ear and right side of her head began to be painful. This condition has become gradually worse until the present time. Has had repeated attacks of shivering and vomiting.

Feb. 6th—Examination :

Marked mastoid tenderness with slight induration. Small amount of pus found in external auditory canal. Canal swollen. Perforation in membrana tympani at posterior inferior quadrant. Temperature 101° , pulse 78. Pain experienced at back of neck upon moving the head. Severe headache, referred to right side of the head. Patient is unable to hold her head up, but rests it upon her husband's arm, nor is she able to stand without assistance.

Feb. 6th—operation ; ether.

The hair in the region of the mastoid was removed with a razor. Skin was well washed with a solution of bichloride of mercury 1 to 5000. An incision was then made over the mastoid region from the tip to an inch above the upper attachment of the auricle. An opening was made into the antrum by means of a gouge and mallet. A small quantity of pus was found in mastoid cells. Otherwise the bone was apparently healthy. Free drainage was established with the middle ear and a current between the wound and the external auditory canal was procured. Wound was thoroughly cleansed with a solution of bichloride of mercury 1 to 5000, packed with iodoform gauze, and the usual dressings applied.

Feb. 7, 1893. Patient noticed to have convergent squint. Paresis of right sixth nerve. Diplopia upon carrying objects into right field. Hyperæmia of both optic discs.

Temp. 100.4° . Pulse 70. 9 A.M.

Temp. 100.4° . Pulse 78. 1 P.M.

Temp. 103.5° . Pulse 78. $6\frac{1}{2}$ -P.M.

Ice cap ordered, and magnes. sulph., drachm every hour.

Feb. 8th. Patient has severe chill at 7 A.M.; ice cap was discontinued. During night, severe pain in head almost continuously. No facial paralysis. Pupil reacts to light stimulus.

9 A.M. Temp. 104.5° . Pulse 88.

11 A.M. Temp. 102.5° . Pulse 84.

3 P.M. Temp. 99.8° . Ice cap reapplied.

$5\frac{1}{2}$ P.M. Temp. 104.5° . Pulse 80.

11 P.M. Temp. 101.4° . Pulse 78. Resp. 26.

The sudden fluctuation of temperature subsequent to the operation suggested to me the probability of deep-seated pus formation, and therefore Drs. Bull, Starr and Vought were called in consultation.

Examined by Dr. Bull. Paresis of right sixth nerve. Beginning papillitis in left disc. Hyperæmia of right disc.

Examined by Dr. Vought. No apparent paresis except right sixth nerve. Reflexes normal. Pain in back of neck on pressure and when she moves. Some rigidity of muscles of back of neck.

Examined by Dr. Starr. Patient lying on back with thighs flexed on abdomen. Temperature on abdomen 103° . Pulse 108. Head turned to left side. Very slight movement of head causes severe pain and rigidity of muscles in posterior part of neck. Surface thermometers applied to scalp in same position on each side, for same length of time register 1° higher on the right side, than on the left. Paresis of right sixth nerve. No diminution in sensation anywhere. Reflexes the same on both sides of body.

Patient stupid and has to be roused to converse intelligently. Percussion on scalp elicits no tenderness anywhere. No œdema of neck or in region of jugular vein. Handling of patient and quick impressions (light), etc., do not cause any pain. Mental condition dull and somnolent, but when roused apparently intelligent and capable of answering questions correctly.

Diagnosis by Dr. Starr. Abscess of brain. Probably in temporo-sphenoidal lobe, possibly in cerebellum.

Just before the operation, the question of diagnosis being under consideration, Dr. Gruening expressed the opinion that the rapid alternations of temperature and the early development of choked disc were indicative of sinus thrombosis rather than of an abscess.

Ice cap during night. Slept from 12 to 2 A.M. and from $3\frac{1}{2}$ to $6\frac{1}{2}$ A.M. Pain in head continually during the night. No chill.

4.15 A.M. Pulse 85. Resp. 20. Temp. 101.4° .

7 A.M. Pulse 94. Resp. 35. Temp. 101.2° .

$8\frac{1}{2}$ A.M. Pulse 96. Resp. 30. Temp. 102° .

Diagnosis by the brain specialists being abscess of the brain and the case being no longer in my province the general surgeon was called upon to operate.

Feb. 9th. 1.20 P.M. Operation by Dr. Abbé.

Opening made in skull. Centre of trephine was $1\frac{1}{4}$ " behind external auditory meatus, along Reid's line and $1\frac{1}{2}$ " above. Circle of bone removed. Dura found pulsating and unusually full,

traversed by two large veins requiring enlargement of bone, opening $\frac{3}{4}$ " in order to secure free dural tissue. Opening curvilinear $\frac{3}{4}$ " in dura, brain substance pouted badly. Needle passed $1\frac{3}{4}$ " to 2" in every direction. No pus found. Dura sutured (continuously) with fine catgut. Wound closed. Catgut sutures. Lateral sinus was then exposed by extending mastoid wound backwards. Sinus found faintly pulsating, thickened, and inflamed. Foul plum-colored venous blood withdrawn at this point from sinus. The internal jugular was then ligated in the neck and cut between the two ligatures below the junction of the external facial with it. The external facial had been tied first. When the ligature was removed from the upper end of the cut jugular, blood came with moderate force showing open petrosal sinus. Ligature reapplied and wound packed. Lateral sinus freely incised (1 inch). Foul septic thrombus found, which was cleaned out. After the lateral sinus was irrigated, there was some hemorrhage from it. Wound was then packed and dressed.

Operation lasted $2\frac{1}{4}$ hours. Ether anæsthesia. 9 P.M., temp. 98.9° . Pulse 104. Resp. 22. Slept from 7.15 to 8 P.M. Complaining of sore throat. Unable to swallow easily. Pain in stomach continually. Mustard poultice applied.

Feb. 10th. 12 M. Temp. 99.4° . Pulse 109. Resp. 25.

3 A.M. Temp. 100.2° . Pulse 108. Resp. 26.

7 A.M. Temp. 99° . Pulse 85. Resp. 24.

Took 3 glasses of milk during the night. Slept from 6.30 A.M. to 8 A. M.

11.30 A.M. Temp. 99° . Pulse 122. Resp. 27.

Took 2 glasses of milk and some vichy this A.M. Wound in mastoid dressed without disturbing other wounds. No odor. Repacked with iodoform gauze. No delirium since operation; no chill.

3.20 P.M. Temp. 100° . Pulse 132. Enema. Poultice over epigastrium.

8 P.M. Temp. 99° . Pulse 85. Resp. 22.

Milk 3 oz. Milk and vichy 3 oz. taken.

12 M. Temp. 100.2° . Pulse 114. Resp. 24.

Feb. 11th. 4.30 A.M. Temp. 100° . Pulse 110. Resp. 22.

11 A.M. Temp. 98.2° . Pulse 124. Resp. 23.

Patient had some delirium during the night. Pulse full and strong. Has taken milk and whiskey frequently. Ice cap kept on. Slept $3\frac{1}{2}$ hours during night. Complained of pain in head.

2 P.M. Temp. 99°. Pulse 130. Resp. 20.

4 P.M. Temp. 98°. Pulse 120. Resp. 22.

6 P.M. Temp. 98.2°. Pulse 116. Resp. 25.

10 P.M. Temp. 100°. Pulse 124. Resp. 24.

12 M. Temp. 100°. Pulse 124. Resp. 23.

Wound dressed. Mastoid wound has odor, others have none. Patient had some delirium during the day. Two hours' sleep during day. Has taken a moderate amount of nourishment in shape of chicken broth, milk, and whiskey. Restless, but no delirium during evening. (Enema.)

Feb. 12th.

4 A.M. Temp. 99°. Pulse 118. Resp. 22.

10 A.M. Temp. 98.2°. Pulse 124. Resp. 23.

Slept fairly during the night. Ice cap kept on head. Is not taking her nourishment quite so well.

4 P.M. Wounds dressed. Odor from mastoid wound, which was cleansed thoroughly before exposing other wounds. Wound in scalp apparently healed, but there is some apparent puffiness, I thought it best to open it again. Found to have some blood clot in it. Wound washed and piece of iodoform gauze put under flap.

Wound in neck dressed. No suppuration. Ligature on facial vein removed. Whole of wounds dressed. Bandage applied.

3 P.M. Temp. 98.2°. Pulse 124. Resp. 23.

Has slept three hours during the day. Has taken nourishment fairly.

6 P.M. Temp. 99.2°. Pulse 120. Resp. 22.

8 P.M. Temp. 100°. Pulse 120. Resp. 22.

12 M. Temp. 99°. Pulse 121. Resp. 20.

Feb. 13, 1893.—Patient slept 2½ hours during the night. Ice bag kept constantly applied. Moaned all night and complained of pain in head. Delirious early in morning.

4 A.M. Temp. 100°. Pulse 122. Resp. 22.

3 P.M. Temp. 102°. Pulse 148. Resp. 20.

11 A.M. Wounds dressed. Some odor in mastoid wound. No odor or suppuration in other wounds. Patient appears more stupid to-day. Has taken scarcely any nourishment since yesterday morning. Anæsthesia of pharynx complete. Cannot swallow.

2 P.M. Patient had sudden change for the worse. She became

semi-comatose; pulse much weaker. 3 P.M. Comatose. Pulse very weak, respiration labored.

5 P.M. Comatose. Resp. slow. Pulse 160°. 5:45 P.M. Temp. 107.2°. 6:05 P.M. died.

11 P.M. Autopsy by Dr. Weeks. Rigor mortis slightly marked. Curved incision through scalp 5 *cm* in length, extending from upper to lower border of auricle 1 *cm* back of insertion of auricle. T-shaped incision through scalp beginning 5½ *cm* from the lobe of the auricle, on a line extending from the lobe to the occipital protuberance, passing upwards for a distance of 6 *cm* in the direction of the bregma. Incision 2½ *cm* long, extending backwards from this incision. With the exception of some infiltration of blood in the region of the wound the scalp was normal. The trephine opening through the skull 2½ *cm* in diameter, which passed through the post. quadrant of the parietal bone just above its groove for lateral sinus, was filled partly with clot and partly with brain substance, which protruded 5 *mm* beyond the surface. On removing the calvarium the veins of the pia were found engorged. There was an opening through the dura, corresponding to the trephine opening through the skull, but smaller. No excess of cerebro-spinal fluid. Right superior and posterior inferior petrosal sinuses engorged.

Right lateral sinus partly filled with a fibrinous light-red clot, which extends into inferior petrosal sinus and internal jugular. This clot was probably of anti-mortem formation. Some sanguino-purulent fluid escaped from the lateral sinus when it was opened. Cerebrum normal, except at a point opposite an opening in skull where the brain tissue was lacerated over an area of 1 *cm* in diameter, extending 1 *cm* into brain substance. Some small cavities filled with blood were observed passing in various directions from this point. No pus. Left half of cerebellum normal.

Right half of cerebellum: two thirds of superior surface of the cerebellum lying next to the median line was covered with thick pus, extending forward to crus cerebelli. There was a shallow depression of the post. part of the right lobe, measuring 5½ *cm* transversely and 1¾ *cm* vertically, which

contained thick pus lying between pia and dura. The depression extended forward just far enough to reach the opening made through the skull from the mastoid process at the groove for the lateral sinus. The tentorium and dura of cerebellar fossa, corresponding with the area of purulent deposit on the cerebellum, were also covered with pus. There was an opening through the dura into the cerebellar fossa, large enough to permit of the passage of a grooved director at a point corresponding to the opening through the skull, from the mastoid cells. This opening communicated with the lateral sinus. No other opening existed.

Two thirds of petrous portion of temporal bone was removed. A mass of thick purulent material was found in the posterior part of the tympanum, lying against the bone. The bone here was discolored, the discoloration extending through the post. wall of the petrous portion at a point corresponding to the union of the inferior petrosal sinus with the lateral sinus. There was evidently some infiltration of the bone tissue with pus.

Death resulted probably from circumscribed suppurating meningitis, caused by purulent infiltration from middle-ear disease.

THE PROPAGATION OF AFFECTIONS OF THE TYMPANUM THROUGH THE CAROTID CANAL INTO THE CEREBRAL CAVITY.

BY DR. OTTO KOERNER, FRANKFORT ON-THE-MAINE.

Translated by DR. MAX TOEPLITZ, New York.

ONE or two small canals (canaliculi carotico-tympanici), as is well known, pass through the osseous wall, separating the carotid canal from the tympanic cavity. A portion of the tympanic mucous membrane receives through these some nutrient vessels directly from the trunk of the carotid. Furthermore, small veins pass in the same path from the tympanic cavity to the venous plexus, surrounding the carotid within its canal, and connected with the sinus cavernosus (*Rectorzik*¹). In some instances the osseous wall between the carotid and tympanum is as thin as paper and exhibits holes for the vessels instead of canals. The walls contain not infrequently small, in some instances very large, interstices (spontaneous dehiscences), which allow the carotid walls to adjoin the tympanic mucous membrane in their entire extent. I have found in two skulls such interstices, which were so large and so situated as to render an injury to the carotid in paracentesis of the membrana tympani quite possible.²

If we consider how frequently pus reaches the cerebral cavity from the tympanum by other existing paths or by those formed by pathological destruction of the bone, we are really astonished, that the knowledge of the extension of inflammations from the tympanum to the adjoining carotid canal and through this to the cerebrum is limited and is

scattered through medical literature. The most important of these observations are found in the foreign, non-otological literature and are thus unknown to the authors of our text- and hand-books on otology.

It is quite proper, therefore, to unite briefly *in one place* all statements of these relations. I may succeed in drawing the attention of aurists for autopsies in this neglected region. One or the other colleague may increase our knowledge upon the subject by adding further notes on the literature.

Even *in simple suppurative inflammation of the mucous membrane of the middle ear* (without affection of the bone), Gruber not infrequently found *purulent exudate in the carotid canal* and purulent infiltration of the adventitious membrane of the carotid artery.'

If the osseous wall of the canal is pathologically destroyed, most frequently in tuberculous and specific affections, *osseous pus*, of course, *reaches the canal*. It surrounds the lymph vessels and the above-mentioned venous plexus.

The *lymph vessels*, leaving the skull through the carotid canal, originate partly along the ophthalmic artery from the eye and from the adjoining tissue of the optic nerve. When surrounded by pus, they may be inflamed and thrombosed. Barker⁴ believes that congestion of lymph, developed in this way, may lead to *swelling of the papilla nervi optici*. According to this author, the not infrequent occurrence of "*choked disk*" in *simple aural suppuration* without intracranial complications is explained in that manner.

The venous plexus connected with the cavernous sinus may also be affected by the presence of pus in the carotid canal. This affection may be propagated into the cavernous (lateral) sinus. Styx⁵ has described a case with symptoms of thrombosis of the lateral sinus, which arose by extension of inflammation from the ear to the contents of the carotid canal. It was a relapsing otitis media with general cerebral symptoms (fever, headache, vomiting, and constipation). In the third week, paralysis of the nervus abducens, passing through the lateral sinus, and choked disc in the side corresponding with the diseased ear, supervened. Keller⁶

also observed in retention of pus in the tympanum with pyæmic symptoms, simultaneous paralysis of abducens and papillitis nervi optici (bilateral). It is true, that it has not been demonstrated in any of these cases, that the affection had extended through the carotid canal to the lateral sinus, but the resemblance of both cases, particularly the simultaneous presence of papillitis and paralysis n. abducens, which are explained by the propagation of inflammation along the carotid, are in favor of *Styx's* view.

Gruber found, with reference to the *affection of the carotid itself*, as mentioned above, in suppuration of the tympanum, *purulent infiltration of the carotid wall; tubercles in the adventitious layer* were found by *Habermann*.

Erosion of the carotid wall and the *fatal hemorrhages* resulting therefrom may be but briefly mentioned, since these conditions are sufficiently known by two elaborate papers published by *Marcé*⁹ (1874) and by *Hessler*¹⁰ (1881). I add to *Hessler's* cases those of *Marcé* and *Toulmouche*¹⁰; collected from older literature, *Moos* and *Steinbrügge*,¹¹ *Sutphen*,¹² *Politzer*,¹³ *Pitt*,¹⁴ have observed each one case, and *May*¹⁵ two cases.

In all these cases the carotid exposed by caries, has not been torn because the osseous support was missing, but because its wall was affected. The carotid does not tear if the wall is sound. *Vohsen*¹⁶ observed, in a consumptive with extensive carious enlargement of the external meatus and tympanum and destruction of the carotid canal, the pulsations of the carotid for weeks without its laceration. The ulceration of the wall of the vessel takes place independently from arterial pressure. It occurs also in thrombotic occlusion of the vascular lumen without pressure in the vessel (*Causit's* case¹⁷).

From the discovery of tubercular nodules in the adventitia carotidis in tuberculous suppuration of the ear (cf. above), *Pitt's* supposition gains credence. This author supposes, *that tuberculosis may be propagated from the tympanum along the vessels of the pia*. He has observed a case of tuberculous meningitis, which was limited to the fossa Sylvii of one side. Apart from chronic suppuration of the middle ear of the

same side, no older tubercular mass could be found to be held responsible for the infection of the pia mater.

From the intracranial diseases, the development of which by transference of inflammation from the tympanum to the carotid canal can only be supposed, our attention is directed to a cerebral affection which, as it has been proven, may develop in this way. This affection is the cerebral embolism in consequence of thrombosis of the carotid in suppurative otitis media and caries of the temporal bone. We owe this knowledge particularly to the clinician *Gairdner*,¹⁹ the great expert in diseases of the vessels, and to the aurist, *Barr* of Glasgow. A diabetic woman, æt. fifty-four, observed by these authors, suffered from suppuration of the left ear, with peripheric paralysis of the facial. She was seized after severe epistaxis, with fever and hemiplegia of the right side, and died twenty-four hours after the appearance of cerebral symptoms in a comatose condition. At the autopsy, a suppuration of the left tympanum, limited to the mucous membrane, was found; furthermore, in the curvature of the carotid, redness of the intima and a præmortal firmly attached thrombus, and finally in the cortex of the left cerebral hemisphere, numerous fresh softenings from embolisms.

Gairdner and *Barr* consider this case as unique, but it does not stand alone as I have found. From the above mentioned case of *Causit*, in which an affection of the aural wall of the carotid had caused thrombosis of the artery, it could be surmised that thrombosis and embolisms might have occurred also in other similar cases. In a case, indeed, observed by *Baizeau*,²⁰ of fatal hemorrhage of the carotid in caries of the temporal bone, a softening of the cerebral cortex caused by embolism was described, which the author has apparently considered an accidental complication. He describes the condition of the parts as follows: the left middle lobe (the hemorrhage from the carotid took place on the left side) presents at its inner surface a small brown lentil-shaped spot, which penetrated 5 mm deep; in its centre a small drop of thick pus is found, which is mixed with softened cerebral substance. At the corresponding

point the arachoroid and the pia mater are sound; there are no false membranes nor adhesions. The external surface of the petrous bone of the cerebral side, or of the side of the base of the skull, does not offer any peculiar conditions.

LITERATURE.

¹ *Rectorzik, Sitzungsber. d. Wien. Akad. d. Wissenschaften*, 1858, 33, 466, quoted from *Urbantschitsch*.

² *Koerner, ARCHIVES OF OTOTOLOGY* (Germ. edit. *Zeitschr. für Ohr.*), vol. xxii., p. 189.

³ *Gruber, Text-book of Otology*, p. 498.

⁴ *Barker, Hunterian Lectures on Intracranial Inflammations Starting in the Temporal Bone*. London, 1889.

⁵ *Styx, ARCH. OF OTOTOLOGY* (Germ. edition), vol. xix., p. 244.

⁶ *Keller, Monatsschr. f. Ohrenh.*, 1888, No. 6.

⁷ *Habermann, Zeitschr. f. Heilkunde*, vol. ix., p. 131, quoted from *Steinbrügge*.

⁸ *Marcé, Ulceration of the Internal Carotid in Caries of the Temporal Bone*. Paris, A. Delahaye, 1874.

⁹ *Hessler, Archiv. f. Ohrenheilk.*, vol. xviii., p. 1.

¹⁰ *Toulmouche*, quoted from *Marcé*.

¹¹ *Moos and Steinbrügge, ARCH. OF OTOTOLOGY* (Germ. edition), vol. xiii., p. 145.

¹² *Sutphen, ARCH. OF OTOTOLOGY*, vol. xv., p. 295.

¹³ *Politzer, Arch. f. Ohrenheilk.*, vol. xxv., p. 99.

¹⁴ *Pitt, Guy's Hospital Reports*, tome 47 (1890), p. 332.

¹⁵ *May, rev. Monatsschr. f. Ohrenh.*, 1886, p. 199.

¹⁶ *Vohsen, Koerner's report on the constituting meeting of the German Otological Society, ARCH. OF OTOTOLOGY* (Germ. edition), vol. xxiii.

¹⁷ *Causit, Bull. de la Société Anatomique*, 1886, quoted from *Gidon, Thèse de Paris*, 1877.

¹⁸ *Pitt, Brit. Med. Jour.*, 1890, I, p. 772.

¹⁹ *Gairdner, Glasgow Medical Journal*, October, 1887.

²⁰ *Baizeau*, quoted from *Marcé, l. c.*

REMOVAL OF THE STAPES.

By CLARENCE J. BLAKE, M.D., BOSTON.

(Continued from page 88 of this volume.)

THE object of the observations of which this series of papers is a record being to determine the conditions under which the operation of removal of the stapes could be most easily performed, the result obtainable in a series of cases selected in reference to their representation of the types of middle-ear disease to which this operation might be supposed to be applicable, and finally, at the end of a year's observation, the report of the results, so far as obtainable, the next step to be noted is the modification of the first stage, that of incision of the membrana tympani, in reference both to the manner of employing the local anæsthetic, and of making the cut. The strength of the cocaine solution was reduced to five per cent., and then to two per cent., without prejudicing the result so far as the accomplishment of local anæsthesia and the effect in preventing bleeding were concerned; the introduction of the solution through the Eustachian catheter was replaced by simple instillation of a few drops of a two per cent. solution in the nostril on the side of the ear to be operated upon, the head being inclined backward toward the corresponding side and finally this even was abandoned and the cocainization accomplished directly by a preliminary incision in the membrana tympani, as described in an article recently published.¹ It having been found also that the continuance of the cut, from the

¹ Exploratory opening of the tympanum and subsequent operations within the middle ear without general anæsthesia.—*Boston Med. and Surg. Journal*, April 20, 1892.

point just posterior to the short process of the malleus downward towards the posterior border of the manubrium, resulted in a turning of the flap outward in such a manner as to interfere with the accuracy of alignment, the incision procedure was divided into two parts—the first consisting in the opening already described, beginning at the round window and following the periphery to the short process of the malleus, the second beginning posteriorly to and half-way down the length of the manubrium, and being carried upward to meet the termination of the first cut, the intratympanic steps of the operation remaining the same as those previously described.

The following cases illustrate not only the points above mentioned, but others in reference to the removal of the stapes, which will be of interest in the general summing up of all the cases to be made at the conclusion of this paper.

A young woman, twenty years of age, slight, of a nervous temperament, and with a chronic catarrhal inflammation of both middle ears, which had grown slowly worse during the ten previous years notwithstanding local treatment and two years' residence in a southern climate, desired the operation for removal of the stapes in the left ear. Both membranæ tympani were considerably thickened and indrawn, this condition being specially marked in the left, in which the Politzer's acoumeter was heard at a distance of two inches, and the tuning-fork (512 v. s.) aërially $\frac{1}{8}$ ths; the voice was heard only when spoken close to the ear in a moderate tone. No cocaine was used in the nose or through the Eustachian catheter, the first step in the operation being an incision about 2 mm in length, at the posterior periphery, just above the position of the round window, causing some pain and slight bleeding, both of which were stilled by the application of a two per cent. solution of cocaine on a cotton-tipped probe, the cut being finished almost painlessly under successive applications of the same solution, and showing, when completed, the incus and stapes clearly, though situated well backward.

Disarticulation of the stapes caused no pain but gave the usual scratching sound; the stapes was extracted from above with the usual sensation of suction and temporary change in pulse, but without pain; the tendon of the stapedius, which was left un-

divided, carrying the stapes upward and backward on its release from the oval window.

Following the removal of the stapes there was a distinct flow of fluid, which continued for four days after the operation, gradually decreasing. Two weeks after the operation, the opening in the membrana tympani had entirely healed, the Politzer's acoumeter was heard at a distance of 26 inches, the tuning-fork aërially $\frac{1}{8}$ ths by bone-conduction $\frac{3}{8}$ ths, and the voice in a moderate tone (heard at the distance of five or six feet immediately after the operation) was heard at the distance of one foot only, and the explodent consonants, T, P, B, and D, were confounded.

The fourth case is of especial interest, as occurring in a man of acute observation, to whom the operation was a matter of interest from a scientific point of view.

The patient was twenty-six years of age, in excellent general health, and had been deaf in the the right ear from childhood, in consequence of a suppurative inflammation of the middle ear, which had resulted not only in the destruction of the membrana tympani, but also in the loss of the two larger ossicles. At the time of the operation the middle ear was perfectly dry, and the mucous membrane of the tympanic cavity, wherever visible, was white and transparent; exploration of the fornix tympani showed that portion of the cavity to be free from obstructions, and the head of the stapes was seen plainly divested not only of its companion ossicles, but also of the stapedius muscle. Tests of the hearing showed the ear to be practically useless, the voice was heard only in a loud tone close to the ear, and neither the medium fork (512 v. s.) nor the large Politzer forks were heard aërially at a distance of one inch from the ear, the larger forks being described as giving only a jarring sensation; by bone-conduction the fork of 512 v. s. was heard in the left, or better-hearing ear, and Galton's whistle was heard only in the lower numbers of its register.

There being no obstacle to the immediate removal of the stapes, and the sensitive portion of the sound-transmitting apparatus having been already destroyed, the use of cocaine was unnecessary. The blunt hook was passed behind the head of the stapes from above, and slight direct traction was made with a view to

testing the fixation of the bone, when, without further effort, and without appreciable resistance or suction sensation, the stapes came away intact, its removal being accompanied by slight vertigo and slowing of the pulse, and followed by immediate improvement of the hearing. Within one minute after the operation a slight blush appeared in the mucous membrane within the niche; this blush rapidly deepened and spread, and at the end of three minutes there was marked congestion of the mucous membrane in and below the niche, and a slight outflow of fluid, presumably perilymph, which outflow was accompanied by an increase of the vertigo. During the succeeding twenty-four hours the outflow of fluid and the accompanying vertigo continued unabated, and then began gradually to decrease this decrease being also accompanied by gradual lessening of the hearing power.

Two weeks after the operation the ear was very nearly dry, and there was no vertigo whatever; the Galton's whistle was heard throughout its whole scale, and the tuning-fork (512 v. s.) was heard aërially $\frac{2}{3}$ ths, and by bone-conduction on the mastoid, $\frac{4}{5}$ ths but the hearing for the voice was not improved in proportion and was found to be very variable. One week later the ear was perfectly dry, and the improvement in the hearing for the voice was inconsiderable.

In the above case one of the notable points is the evident improvement in hearing by bone-conduction, as the result of the removal of a fixation obstacle which presumably for the time being impaired the intra-labyrinthine sound transmission in accordance with a law governing the propagation of sonorous vibrations in fluid in inclosed spaces, and the occurrence of the vertigo coincidently with the outflow of fluid, presumably labyrinthine, would permit at least the inference that the vertigo was the result of a change in a fixation condition to which the parts had become accustomed, and that the release from supporting pressure consequent upon the outflow of the labyrinthine fluid was accompanied by a congestion in the semi-circular canals giving rise to those symptoms of general vertigo which the patient experienced until the visible congestion in the middle ear had greatly decreased and the outflow had entirely ceased.

Among the symptoms observed by the patient in this case were the alterations in hearing of his own voice.

The right ear had been for a long time virtually useless, and the removal of the obstruction, presented by the stapes and its attachments, to the passage of sound waves and the change in the intra-labyrinthine condition which improved hearing by bone-conduction enabled the patient to hear both aërially and by direct transmission those sounds of his own voice of which he had previously been only monaurally conscious.

It was not therefore the dual sensation in the right ear which had to be considered, but the effect of binaural hearing under conditions essentially different in the two ears.

The result as to general hearing with both ears open was a sense of confusion which was relieved when one or other ear was stopped. If the left ear was first stopped the sense of confusion continued for a longer time than when the right ear was stopped and monaural hearing was practised with the left ear alone, the new phase of hearing brought about by the operative alterations of its condition in the right ear requiring apparently a mental effort of adjustment to the new sensation.

The great changes in the hearing for the voice in the right ear, coincidently apparently with the fluctuations of the flow of fluid from the labyrinth afforded another variable factor in the problem under observation. These alterations in the hearing for the voice were marked more by changes in degree of intensity than in pitch, the change from good to moderate hearing being sometimes sudden and sometimes gradual, within a few hours, all of which symptoms were compatible with the mechanical conditions a vibrating apparatus immersed in fluid no longer invariable in its relationship thereto.

J. G. J., a man fifty years of age, was first seen in December, 1888, with progressive chronic catarrhal trouble of both middle ears. In the left ear there was decided circulatory tinnitus, and the hearing as tested both by the acoumeter and tuning-fork was one half that in the right ear.

Under local treatment the hearing in the left ear improved but subsequently, in consequence of repeated head colds, considerably decreased, so that shortly before the operation the hearing both

for the acoumeter and for the tuning-fork 512 v. s. was inappreciable. In this case three minutes before the operation the catheter was used with two drops of a two per cent. solution of cocaine and the incision on the membrana tympani was completed painlessly with but one application of the solution to the cut edges.

The stapes was high up, and the division of the incudo-stapedial joint was accomplished only with difficulty. Mobilization of the stapes by means of the angular knife and the removal of the bone from the niche, accompanied by the sensation of a loud sound, was followed by the outflow of fluid and by an immediate increase of hearing for low tones, which improvement, however, considerably diminished during the succeeding twenty-four hours.

The operation, including the tests made during its progress, lasted thirty minutes, and was without pain to the patient, who described with precision the noises incident to that part of the operation within the middle ear.

One week after the operation the wound in the membrana tympani had entirely healed, and the hearing both aërially and by bone conduction was the same as before the operation.

Mrs. A. R., fifty-six years of age, was first seen two weeks before operation; the patient was slender, not very strong, and had a history of repeated head colds and a gradual decrease of hearing in both ears.

Both membranæ tympani were slightly opaque and indrawn; both Eustachian tubes were free; the hearing distance for the Politzer's acoumeter was, in the right ear, three inches, and in the left ear one half inch; the tuning-fork 512 v. s. was heard in the right ear $\frac{2}{3}$ ths in the left ear $\frac{1}{3}$ ths, and by bone-conduction on the mastoid process in the right ear $\frac{2}{3}$ ths, and in the left ear $\frac{1}{3}$ ths.

Shortly before the operation a few drops of a two per cent. solution of cocaine were injected through the Eustachian catheter. The preliminary cut in the membrana tympani caused pain, which was stilled by means of a ten per cent. solution of cocaine, and the cut was then continued painlessly; all that part of the operation within the middle ear was also painless unless the shaft of the instruments touched the cut edge of the membrana tympani. The incudo-stapedial articulation was high up and far backward, and the division of the stapedius tendon, apparently complete, was probably in fact only partial, as after division of the articulation the attempt at removal of the stapes, resulting in the fracture of

the crura coincidently with the lifting of the base plate, was immediately followed by the disappearance of the fractured crura and head of the stapes upward and backward.

Up to this point in the operation, which the patient had borne well, there was no symptom other than that of fatigue, but with the fracture and partial removal of the stapes there was vertigo, general depression, temporary unconsciousness, and a change in the pulse, which became small and rapid—112.

These symptoms, together with nausea, continued without abatement for nearly an hour, at the end of which time the patient could keep her eyes open without vertiginous sensations, and dizziness was evoked only on rotating the head slightly upon the pillow. This vertigo slowly decreased during the succeeding three days, but had not entirely ceased until nearly two weeks later.

Tests of the hearing made during the operation showed a slight improvement in the hearing on completion of the incision in the membrana tympani and this improvement markedly increased during the succeeding steps of the operation.

Eighteen days after the operation, the opening in the membrana tympani having healed, the Politzer's acoumeter was heard at the same distance as before operation, and the same tuning-fork used in previous tests was heard aërially $\frac{2}{3}$ ths, and the voice in a loud tone was understood at a distance of three feet.

In both of the preceding cases a point with reference to the voice tests which had been observed in other cases was worthy of note: in both of them the voice was heard apparently much better immediately after the operation than before, but an analysis of this apparent improvement showed that it related rather to volume and intensity than to an improvement in that differential perception of sound values which constitutes our means of distinguishing the relationship of the consonant sounds.

In both instances, the voice, used as nearly as possible with the same force and making use of the same test sentences as before operation, was described as being louder but not as more distinctly heard; and in one case the patient described the sensation in hearing the voice as so altered from the standard to which he had become accustomed in using the other ear as to give him a very definite sense of confusion.

A CASE OF OTITIS MEDIA ACUTA PURULENTA
WITH CARIES OF THE MASTOID PROCESS DUE
TO CARIES OF THE SECOND MOLAR TOOTH.

By DR. E. SCHWARTZ, OF GLEIWITZ, SILESIA.

Translated by DR. MAX TOEPLITZ, New York.

Hugo J., age twenty-one, of Grünberg, presented himself on September 12, '91, at my office with violent pain in the left ear, lasting two weeks, and otorrhœa of a week's duration with subsidence of the pain.

The external auditory meatus was found to be filled with thin secretions and its osseous portion to be reddened after their removal. Its *antero-inferior* wall close to the membrana tympani was so much thickened as to leave, posteriorly and above, a fissure of nearly a millimetre in width, through which the corresponding segment of the membrane could not be seen distinctly. This hemispherical thickening, when probed proved to be of bony consistence, giving a distinct impression of exostosis with infiltrated periosteum. This supposed exostosis gave so much the less uneasiness, as aërial douche with catheter produced loud perforation noise and considerable subjective relief, so as apparently not to disturb the permeability. The catheter was readily introduced, although after every introduction slight bleeding occurred from the nose, which on inspection revealed that the dark-red mucous membrane of the nasal floor was swollen and loosened. The decrease of secretions from the tympanum, the constant improvement of the patient together with the cessation of hemorrhage, drew my attention away from this phenomenon and led me to suspect spontaneous improvement of the affected nasal mucous membrane.

On Sept. 21st (ninth day of treatment), in introducing the

catheter, increased swelling of mucous membrane of the floor of the left nostril was felt, and a few drops of blood oozed from it so as to direct my attention to this fact and lead me to the supposition of its local cause in the superior maxilla. A carious root of the second molar tooth was thus found in the left alveolar process of the superior maxilla, and about $1\frac{1}{2}$ cm above in the hard palate a fistulous opening, through which the probe penetrated 1 cm deep in the direction toward the tip of the carious root. The patient, when questioned, now stated that he suffered for more than five years from sensitiveness of the palate until the present time, but without great inconvenience. Three days subsequently to the immediate extraction of the root the fistulous opening could hardly be detected in the palate, and after two further days was completely closed. At the same time the mucous membrane of the nose assumed its normal condition, whilst the hemorrhages did not take place after introduction of the catheter.

On Sept. 25th (thirteenth day of treatment) the *posterior* wall of the external meatus appeared thickened and was immediately incised in the entire length of the osseous portion. The patient felt relieved, according to his statement, on the following day. On Sept. 27th he complained of extreme weakness and headache in the left side; the processus mastoideus was sensitive upon pressure, just as the previous day. The thickening of the posterior wall of the external meatus is progressing upward. In the evening, chills and febrile delirium, with a temperature of 40° C. ensued. On Sept. 28th at noon, chiselling of the mastoid process was performed after an additional thickening of the *upper* wall of the external meatus had been found upon examination. The physicians *Struwe*, *Neumann*, and *Kreisel* kindly assisted at the operation.

An incision, 1 cm from the insertion of the auricle, parallel with the latter, was made into the normal tissue over the left mastoid, and the moderately thickened periosteum is readily ablated and placed to either side; slight hemorrhage occurs. The osseous surface presents a moderately grayish discoloration. After marking the upper operative boundary line at the planum mastoideum at a level with the spina supra meatum by a stroke of the chisel, the opening with the chisel is started from this spot. After the removal of three small osseous splinters a drop of yellow pus oozes out. A few granulation pearls are removed with the

sharp spoon ; the underlying osseous tissue proved to be healthy, so as to render a deep operation unnecessary. During cleansing with the cotton pellet, suddenly a small drop of pus oozes from the *upper* margin of the opening, immediately below the cortical layer of less than 3 *mm* in thickness ; this is followed by the chisel and the osseous opening extended farther upward at $\frac{1}{2}$ *cm*. A few granulations are removed with the sharp spoon from this extended opening, below which healthy osseous tissue is found. A third drop of pus oozes, but now from the posterior margin of the enlarged opening, immediately below the osseous surface, and granulations are also found. This flow of additional pus is from 4 to 5 times repeated, and the operative surface made to follow the pus is band-like and approximately 1 *cm* wide, of the shape of a horse-shoe with the concavity toward the auricle. In the outer limit of the posterior portion of the operated region an osseous cell of about $\frac{1}{2}$ *cm* in diameter filled with pus and granulations was opened. A drainage tube was placed into this cavity, the other end reaching the anterior portion of the operative field. The edges of the wound were united by three stitches.

At 6 P.M., 38.7° C.; at 8 P.M., 38.5° C.

On September 29th, in the morning, 37.7° C.

On September 29th, in the evening, 37.6° C.

The patient feels very well ; extreme perspiration, no headache ; tongue coated. During the entire period of convalescence the temperature did not rise above 37.3° C.

A week subsequently to the operation, the cleft of the external meatus, through which the posterior-upper segment of the membrana tympani was visible, became wider, which was due to the decrease of infiltration of the posterior upper wall of the meatus, but the cleft gradually increased every week, until in the beginning of November the entire posterior upper third of the membrana tympani appeared. I still explained this phenomenon by the decrease of the swelling of the periosteum belonging to the exostosis. In the course of the further out-door treatment the perforation of the membrana tympani was closed, the noise during the aërial inflation became broader and blowing. In the middle of November the handle of the malleus presented itself in the tissue of the membrana tympani of pale-pinkish color. Whispered voice was well perceived with the left ear turned away, up to a distance of 5 metres, and at the end of December the supposed exostosis had entirely disappeared. The normal drum

membrane presented itself in its entire extent. On December 23d Mr. J. was discharged from my treatment as completely cured.

REMARKS.

I am convinced that the entire affection had originated from the carious root of the second molar in the left superior maxilla. The caries was transmitted to the upper jaw; whence the fistula occurred in the hard palate, which was readily closed after the removal of the dental root at fault. Thence the virus had affected the periosteum and simultaneously the mucous membrane upon the left nasal floor, consequently its redness, swelling, and slight hemorrhage during introduction of catheter, which ceased immediately and completely after the removal of the dental root. The periostitis had extended from this region through the Eustachian tube into the tympanum and also into the osseous portion of the external meatus, where it first reached the *inner-lower* portion, corresponding with tympanic opening of the Eustachian tube, and formed a circumscribed and hemispherical infiltration, which I had considered erroneously up to the final time of my observation as a genuine exostosis. (cp. *Politzer, Text-book of Otology*, German edition, 1882, p. 703: "The causes of development of exostoses are . . . 2, circumscribed, chronic periostitic inflammations in the osseous external meatus.")

The periostitis, which was *secondary* upon the superior maxilla, but *primary* in the tympanum and mastoid process, had progressed to this region, when Mr. J. came under my observation. I have observed and described above the way in which the periostitis had implicated the posterior and also the upper wall of the external auditory meatus. When on September 25th the posterior wall of the external meatus was found to be thickened, the periosteum lining the external surface of the mastoid process also had then positively been implicated in the inflammation, a phenomenon which could not objectively be observed, nor cause well localized objective symptoms. The period from September 25th to 28th, viz., four days, sufficed, in order to necrose the exter-

nal osseous layer to a depth of about $\frac{3}{4}$ cm. Chiselling was done in time so as to prevent more extensive caries of the spongy layer.

It is quite important for the correctness of my view that the periostitis, in advancing from the antero-inferior wall of the external meatus to the external surface of the mastoid process, first implicated the *posterior* and on the day prior to the operation also the *upper*, wall of the meatus. *Schwartz* describes as an important symptom of caries of the mastoid, the infiltration of the *postero-superior* wall of the meatus in its osseous portion, and with this symptom I could invariably confirm the diagnosis of caries by the operation, particularly in some cases of chronic suppuration of the tympanum, in which (characteristic subjective symptoms excepted) nothing abnormal could be objectively found in the mastoid process. In all these cases the above-mentioned periosteal thickening was *the consequence* of caries of the mastoid of long standing, whilst in our case, as it appears from the operation, the central portion of the mastoid process exhibited normal relations.

Whilst the caries usually takes an outward course from the tympanum through the mastoid antrum, the centre of the mastoid process, in this case, the caries, if I may use the term in its widest sense, has proceeded through the tympanum and the external meatus to the external surface of the mastoid process, in order to penetrate the external wall centripetally. With reference to the mastoid process, the periostitis of the external surface was *primary*, the caries *secondary*.

If my view is correct according to my statements, my case demonstrates that the condition of the teeth should not be overlooked either in *nasal* affections, as *Ziem* and others have repeatedly and urgently pointed out, or in carious and non-carious *aural* affections.

THE ANATOMICAL CONDITION FOUND IN A CASE OF DEAF-MUTISM FOLLOWING SCARLATINA.

By DR. V. UCHERMANN, CHRISTIANIA.

Translated by Dr. S. E. ALLEN, Cincinnati, O.

THE following case of acquired deaf-mutism was examined by me, in the Pathological Institute here, as long ago as 1883. The publication of the case has been deferred until now on account of deficient information as to its etiology, which has only lately become clear.

I had also hoped to be able to submit the results of other anatomical examinations on deaf-mutes, but circumstances have not been favorable. I hope, however, in the future, when the schools for deaf-mutes become public or come under public inspection, to more easily obtain material for examination. In the meantime I do not want to hold back my case any longer.

Johann Arnesen Nor, Brandvold, eighteen years old, died in 1883.

Post-mortem Record.—Tuberculosis pulmonum. Cavernæ tuberculosæ et bronchiectasia, ulcera tuberculosa ilei et cæci.

At the age of two and one half years contracted scarlatina, as a consequence of which deaf-mutism.

Examination.—Right ear. External meatus and tympanic membrane normal, likewise the mucous membrane of the tympanic cavity and the ossicles. Stapes immovable (ossified annular ligament). Membrana rotunda forms bony plate. Malleus and incus movable. Tensor tympani well developed. Of the semi-

circular canals there is present but a slight indication in the form of a canal one half of a centimetre long, filled with fibrous connective tissue and corresponding to the *canalis semicircularis superior*. The vestibule forms a small cavity lined with thick periosteum. No indication of the sacculus. Forward and slightly outward from the ossified fenestra rotunda, one sees a small, irregular, undivided canal one and one half centimetres long. Otherwise there is no trace of the cochlea, except a yellow, somewhat porous circle in the bone indicating its position. The acoustic nerve, of normal appearance and size, divides at the bottom of the meatus auditorius internus into two branches which penetrate into the bone.

Left Ear.—External auditory canal filled with pus. Five perforations in the thickened membrana tympani. Tympanic cavity filled with muco-pus and crumbling masses, as are also the remaining cavities in the temporal bone. The ossicles movable. Tensor tympani somewhat atrophic. Membrana rotunda ossified. Labyrinth and acoustic nerve appear normal. In the cochlea and internal meatus no pus.

The brain was examined in December, 1890, by Prof. G. Güldborg, who kindly communicates to me the following:

Abstract.—"A deaf-mute's brain hardened in Müller's fluid, shows upon its surface, as far as can be judged from a hardened specimen, on the whole, normal conditions. The central gyri are well developed. The occipital fissure extends in deeply on the convexity. Broca's convolution seems to me to be narrower than normal. The upper temporal gyrus on the left side appears also somewhat narrower than usual. The microscopical examination shows nothing positively abnormal.

The case presents various points of interest. It is the first specimen of deaf-mutism due to scarlatina. Of the one hundred and twenty-six post-mortem appearances observed in cases of deaf-mutism, published up to date, thirty-two concern hereditary and thirty acquired deafness, while of the origin of sixty-four nothing is said. It is clear that an essential part of the interest in these post-mortem examinations is lost if we do not know by what diseases the changes pointed out have been produced, or even whether the deafness was hereditary or acquired. The clinical history of these cases is all the more necessary as a certain conclu-

sion concerning the character of the primary disease can often not be formed from the anatomical appearances. For example, inflammation in the labyrinth can bring about such a complete sclerosis of the pars petrosa, together with osseous changes in the membranous parts, that almost no trace of the semicircular canals, cochlea, or spongy tissue can be discovered. One finds only a smooth mass, hard as ivory, with normal external contours, so that at first one is most inclined to consider the condition hereditary. Mygind (Denmark), in *Archiv für Ohrenheilkunde*, Bd. xxx., in summarizing the results of anatomical examinations of the organ of hearing in deaf-mutism, lays great stress upon this fact.

The case is still further remarkable in that the disease in the right ear appears to have been limited exclusively to the labyrinth, the membrane and tympanic cavity not showing the slightest sign of previous inflammation. The ossification of the annular ligament and of the membrana fenestræ rotundæ appears to have developed from the labyrinth side, as the tympanic side showed no trace of osseous or fibrous new formations. In the left ear, on the contrary, the middle ear, with the spongy part of the pars petrosa and the processus mastoideus, was diseased; here also was ossification of the membrane of the round window, while the annular ligament was found movable. Moreover, since the semicircular canals, vestibule, and cochlea were found to be normal, with no trace of pathological fluid or new formations, it is to be accepted that the ossification here started from the tympanic cavity. In this ear probably a slight amount of hearing existed, but not enough to obviate the deaf-and-dumb condition. Unfortunately, concerning this, no examinations were made, which would have been of the greatest interest with reference to the question as to what influence a rigid membrana fenestræ rotundæ would have upon the hearing of an otherwise intact inner ear.

Thirdly, the case contributes to the pathology of middle-ear complications in scarlatina. The most widespread acceptation undoubtedly is that the inflammation extends from the pharynx to the middle ear and then causes a secondary labyrinth inflammation with deafness. In a class of

cases the view that the pus breaks through the membrana rotunda or the carious labyrinth wall is undoubtedly correct, or that the suppurative process causes an osseous or fibrous new formation in and around the windows. There are, however, other cases where the deafness arises acutely during the disease without the middle ear being especially or at all affected. In such cases we find the drum normal or but slightly dulled, the hammer being perfectly movable (Delstanche), the Rin   experiment is positive, there is absence of bone-conduction, and often total deafness. As Moos has demonstrated in measles and diphtheria and also in scarlatina, there takes place here undoubtedly a penetration of bacteria into the labyrinth, either directly by the blood or lymph channels, or indirectly from the subarachnoid space through the aqu  ductus cochle  . Again from the subdural space, which, according to Key and Retzius, is in communication with the nose and lymph vessels of the nose, can the infection, attacking the saccus endolymphaticus, extend through the aqu  ductus vestibuli into the endolymphatic channels of the inner ear. Here, according to Moos, the bacteria cause a coagulation of the endo- and perilymph, together with stasis, thrombosis, and vessel necrosis.

Moreover we find, especially in scarlatina, as my case plainly shows, an infiltration of the Haversian canals and hollow spaces, together with an hypertrophy of the periosteum and subsequent ossification of the newly formed tissue. A case published by Mygind (*Hospitalstidende*, 1890) shows that the same changes occur also in measles. After meningitis cerebro-spinalis such a change is not unusual. It is altogether probable that all mycotic diseases can give rise in a similar way to labyrinth affections and deafness. As a matter of fact, in my examinations here in the country, I have found single instances of such cases following varicella, rubeola, pneumonia, and pertussis. Probably a case which occurred after an acute eczema may be explained in the same way. The changes in the brain, reduction in size of the third left frontal gyrus (Broca's convolution), and of the upper left temporal gyrus, agree with the other appearances in that the dumbness could have brought about an atrophy of these

convolutions due to the diminished functional activity. The complete destruction of the labyrinth on the right side could have produced the same condition of the temporal gyrus of the left side. According to the researches of Munk, there is reason to believe that there takes place a crossing of the fibres of the acusticus in the brain.

ON THE CLINICAL SIGNS OF THE AFFECTIONS OF THE AUDITORY NERVE.

BY PROF. G. GRADENIGO, TURIN, ITALY.

Translated by Dr. S. E. ALLEN, Cincinnati, O.

I HAVE had the opportunity of studying a few, in my opinion, not uninteresting cases of deafness attributable to lesions of the acoustic nerve. In one of these, which had to do with a cholesteatomatous tumor on the left nerve, I was able to demonstrate by anatomical examination the integrity of the labyrinth. The clinical characteristics with which I met in the largest proportion of acoustic affections, and which can serve as diagnostic criteria in doubtful cases, were the following.

I. Diminution of the acuteness of hearing, and that too demonstrated by examination with tuning-forks, and more markedly by examination with forks of middle register. This diminution was associated with the other clinical symptoms which in general are proper to affections of the perceptive apparatus. As a differential diagnostic criterion, one observes, in affections of the nerve, that the acuteness of hearing for high tones, which diminishes the earliest in changes of the labyrinth, is here well maintained.

The functional defect for middle tones increases in some cases to a complete disappearance of perception for some of these tones (for example c^1). This can be made out only by tuning-fork examination and not usually by means of other musical instruments which possess overtones (violin, horn, organ pipe, etc.). In two cases in which a diagnosis of a lesion of the acoustic could have otherwise been made,

as there was present double-sided deafness with various cerebral symptoms, the character of the functional defect, which was especially marked for high tones, justified the diagnosis of inflammation of the labyrinth, and this diagnosis was confirmed by the statements of the patient and the clinical course of the disease. In keeping with the relatively good preservation of perception for high tones, the watch and in some cases my osteo-tympanal *audimeter* which produces weaker tones than the watch, could be perceived by osteo-tympanal conduction.

These results confirm those I stated three years ago, based upon the examination of two cases of nerve disease.

II. Another important clinical characteristic with which I have met in some affections of the acusticus, consists in an excessive functional exhaustibility. According to my experience, this symptom may be met with, although very seldom, in middle-ear affections, especially in neurasthenic individuals. This exhaustibility is also often produced by alterations in the inner ear, but only in affections of the auditory nerve does it reach a sufficiently marked degree to be characteristic. The functional exhaustibility is often so considerable that the results of the examinations by the different methods became so essentially modified that it is impossible, if no account is taken of this fact, to form an accurate conclusion as to the amount of hearing power present.

The methods of studying the functional exhaustibility of the acusticus are different. Better than the other methods of examination, among which stress is to be laid on that advocated by Eitelberg, is the examination by means of an instrument modelled on a telephonic *audimeter*. With this I have been able to accomplish the end in view very satisfactorily. I proceed in a twofold manner: first, I determine the least intensity of tone that can be perceived, then I expose the ear a minute or so to the greatest intensity of the same tone which I can obtain from the instrument. I then reduce the tone quickly to the minimum intensity heard in the beginning. While now a normal ear, in spite of the quick reduction in intensity, still perceives the tone,

in cases of great exhaustibility this perception either ceases for several seconds or is entirely lost.

By means of the other method of examination I am able to follow up more exactly the gradual decrease in the functional energy. After establishing the minimum intensity that can be perceived, I expose the ear to the action of that tone. If the functional exhaustibility is considerable, the patient after a few seconds ceases to perceive the same. In order to renew the perception, it is necessary that the intensity of the tone be progressively increased from time to time. In some isolated cases, I was able to recognize that the functional exhaustibility preceded a temporary increase of the power of hearing.

Up to the present time, I have not had at my disposal sufficient clinical material to be able to assert that the above-mentioned characteristics of affections of the auditory nerve occur in all cases. It is probable that the different pathological changes in the acoustic nerve would present various points of difference on examination. I found this symptom of exhaustibility in cases of neuritis (caused by trauma, compression) and also in cases of secondary or primary atrophy occurring in tabes dorsalis. I should like to add that the acoustic nerve comparatively seldom participates in the various intracranial pathological changes, and that certain forms of deafness which occur in neuropathic individuals, and which therefore, at the first glance, seem to be dependent upon intracranial disease, will be found on thorough examination to be due to some unimportant alterations in the inner or middle ear. I do not desire here to enlarge upon hysterical anæsthesia of the acoustic nerve. This exhibits special symptoms, among which stress is to be laid upon the absence of attacks of dizziness and upon the uniform distribution of the defects in the musical scale.

In cases of beginning neuritis of intracranial origin, in which as yet no important functional alterations have ensued, the electrical test can be of great value, as by it the excessive irritability of the nerve can be demonstrated.

SOME FURTHER INVESTIGATIONS UPON THE
CONTINUOUS TONE-SERIES, ESPECIALLY
WITH REFERENCE TO THE PHYSIOLOGI-
CAL UPPER AND LOWER TONE-LIMIT.

BY PROF. F. BEZOLD, MUNICH.

Translated ¹ by Dr. E. B. DENCH, New York.

(*With two Illustrations.*)

IF in the following I present to-day some observations upon the use of an unbroken series of tones for testing the hearing, as introduced by me two and one half years since, the reader must expect nothing absolutely conclusive. In the first place, the time is too short to settle with a sufficient number of clinical cases the most important query which this promises to enable us to determine, namely, the occurrence of such tone defects as we must relegate to middle-ear affections. These have seemed to me to be more common than we would judge from a consideration of the cases reported in literature; they are found invariably only in a small proportion of the affections of the internal ear, and these, moreover, constitute but a small part of aural affections. Again, in the further pursuit of the investigations, the necessity presented of amplifying the tuning-fork series, at least in the lower portion of the scale, since this would determine the physiological variations met with here.

Upon the presentation of my continuous tone-series at the Nuremberg Society of South German and Swiss Otol-ogists in 1890, and at the Otological Section of the Tenth International Medical Congress at Berlin, certain objections were raised against their employment.

¹ Two tables omitted.

According to Lucae and Schwabach, both the low and high notes, if of great intensity, would affect the ear. In the exhaustive method of investigation advised by me, we need use only a sufficient intensity in the various tones of the series to be just perceived with certainty by the affected ear. By the use of the loud high-pitched fork, long ago advised by Lucae, no investigator has ever deviated from the beaten path.

A second objection, made first by Politzer, and later by Lucae, Gradenigo, and Barth, is based upon the admitted unreliability of the test with a single form of instrument for producing a given note. It may happen that the same tone which, if produced by vibrating tuning-forks, is not heard by the diseased ear, may be perceived if emitted from organ pipes, flutes, horns, trumpets, sirens, etc. Flutes, trumpets, and sirens are instruments not at all free from overtones. They cannot be considered here. The only instruments relatively free from overtones which we can compare here, are, according to Helmholtz, tuning-forks and wide covered organ pipes. We have no means of comparing exactly the intensity of the tone produced by both instruments, and our subjective judgment cannot be accurate. It is quite possible that in a given case a tone produced by a tuning-fork may not be heard, while the same note from an organ pipe may be perceived. By this nothing more is proven than that the perception of this note is greatly lessened, but not completely absent; that, in other words, there is a relative but not absolute tone-gap. Frequently enough I have had the opportunity to demonstrate absence of perception for the same tone, produced upon these two different testing instruments, and then we are justified in assuming an absolute tone-gap for the given note of the scale, so far, indeed, as the intensity of the pure tones employed permits us to determine such a condition. An instance in which the weaker tone of the one instrument has been heard, while a stronger and equally high tone produced by the other has not been perceived, has never happened to me at least.

When in Nuremberg two and a half years ago, I advocated

the use of the continuous tone-series for the first time. Politzer believed that, if only the clinics would use the full series, perhaps further investigations would show that the practitioner could get along with a few less forks. At present, the complete series is in the hands of but few investigators. A single manufacturer made all the instruments according to my directions, and under my personal control. Since I naturally could not continue the same supervision, in the instruments made subsequently, it appears clear that, in addition to the high price, the fact that the successive instruments are not entirely identical, explains an important impediment to their application.

For my part, the necessity of this series of instruments has become of so much importance in the hands of the otologists, that I believe we shall yet live to the time when one can as little think of the otologist without them, as of the ophthalmologist without the perimeter.

The incompleteness of the tone-series made itself felt very soon, at the lower end of the scale, in the course of diagnostic tests. I had carried it to the contra C (32 double vibrations) by means of a heavily clamped tuning-fork. This tone is, however, an octave removed from that which Preyer fixes as our physiological lower tone-limit.

The fork C¹, as a rule, suffices for the determination of the lower tone-limit in pathological conditions of the middle ear, since this tone in chronic affections without an exception, and in acute cases for the most part, falls without the hearing limit. A great number of cases in which the hearing is markedly impaired, are found among diseases of the internal ear, which hear this tone very well, so that, for a complete examination of these patients, a lower tuning-fork appears to be an absolute necessity.

I applied for this to Appunn in Hanau, who had made Preyer his instruments, for the determination of the tone-limit, and received a fork which furnished at least partially the desired octave. Through the co-operation of our physiologist Van Voit, it was possible for me to test this, and to register the number of vibrations. It was found that, by moving the heavy clamps, a series of tones could be pro-

duced from $19\frac{1}{2}$ to 34 double vibrations per second. It did not reach, however, as far as the lower limit determined by Preyer, of 16 double vibrations. Consequently I had made for me, by Appunn, a second tuning-fork, similar to the above, and provided with clamps, with the exception that both branches were 6 *cm* longer, the movable weights being the same.

Being possessed of this, for a long time all patients whose lower tone-limit was within the range of these two forks, were tested with both instruments. It was shown that, in the cases where defects were present in the lower part of the scale, the weights must be fixed at almost the same distance from the forked end of the branches, in both cases, in order that the tone should be just perceived. The lengthening of the slender branches of the fork, as compared with the loading with heavy weights, need scarcely be considered. Therefore, through this lengthening, a further portion of the lower part of the tone scale was gained. In the last year we have determined the rate of vibration of this long tuning-fork, at the Physiological Institute in Munich, by recording vibrations of this upon a revolving cylinder, while an electric chronometer indicated upon the vibration curve the second intervals. The tuning-fork in these experiments, provided with a marking point, was held in the hand close to the cylinder, the same as in examining the ear.

The record of this longer tuning-fork showed that, by the aid of both clamps, and by moving them, the whole tone-series could be produced at the lower portion of the scale, which to this time had been wanting; that is, the tones from 16 to 30 double vibrations. An over-tone is produced at thirty vibrations, but this is easily eliminated by touching the branches at the lower end. The tones become weaker and weaker in descending the scale, but the greater number of those examined by me perceived, even for sixteen vibrations, a deep low tone, if the examination was made in a perfectly quiet place. The individual vibrations were distinctly perceived by the eye as well as the ear. A smaller number, whose hearing was otherwise normal, perceived absolutely nothing during the strongest vibration

of this fork, at this low point, and for a portion of the scale above it. The last observation appears certain, since no extraneous noises were present.

The determination of the lower as well as the upper tone-limit, in a greater number of persons with normal hearing, as of any determination of the normal condition, which is capable of exact measurement, demands an attention which far exceeds our present otological attainments. Aside from the twenty-three pupils with normal hearing, whose functional examination Siebenmann has undertaken, and published in this journal, no more extensive series of investigations, with references to individual conditions, has been made up to the present time.

The upper tone-limit was measured by Siebenmann, by means of the Galton whistle; it lay, according to the instrument which he used, between 1.3 and 1.9. The tuning-fork employed for the lower tone-limit (C — 1, thirty-two double vibrations) lies so far removed from the true limit, that we ought not to wonder that it was perceived by all the cases tested.

The significance of age, in relation to the extent of the normal hearing limits, has of late been brought forward by Zwardemaker (*Archiv für Ohrenheilk.*, vol. xxxii., p. 53), who gives a graphic representation, in the form of a curve, of the narrowing of the limits of hearing with advancing age. In a great number of individuals of different ages, which are not specifically given with normal hearing, Zwardemaker determined the upper tone-limit by means of the Galton whistle, as Siebenmann did, and found it to be 1.25 in childhood; with the advance of years it continually became lower, to from 2.5 to 4.0 in old age.

He sees here a condition, which is clearly developed by systematic investigation. Pathological processes in the middle ear exert so little influence upon the progress of lowering the tone-limit of sound perception, that it is easy in a great assembly to arrange the individuals tested, according to their age, from the results obtained with the Galton whistle. He tested the lower tone-limit on only a few individuals with the Appunn metal plate, but believed that,

with more advanced age, progressive narrowing could be determined here.

After these investigations, it appears necessary, before we undertake a classification of the perception of the tone series in diseased ears, to determine the upper and lower tone-limits, not only absolutely, but also relatively, as met with at different periods of life.

Since I have had the low tuning-fork of 16-30 vibrations, I have tested a number of normal ears (190) for the upper and lower tone-limits. As the period of advanced life must be taken into consideration in this investigation, for this reason, the limit of normal hearing power in general, as evidenced by the test with the whisper, must not be placed too high, and every case was designated as normal, which, in addition to other numbers, was able to understand, under proper precautions, the whispered number "100." The upper tone-limit was also determined by me, with the Galton whistle.

If we consider the summary, the absolute upper tone-limit upon the Galton whistle used by me was found to be 1.5 of the scale; only two cases reached the limit. In thirteen cases the limit was 1.6; in thirty-three, 1.7; between 1.7 and 2.2 in 105 cases; between 2.2 and 3 in thirty-four, and from 3. to 3.6 in three cases only.

From this series of figures, we can plot a curve, with a distinct culmination point, at 1.7 with a precipitate and constant descent at the upper part, and a slower and not quite regular descent to the lower limit. This last will become more uniform, as the number of cases tested becomes greater.

In the following figure I have made a graphic presentation of the results obtained, both by Siebenmann and myself, in testing with the Galton whistle. The successive tenths of the scale of the whistle are laid out upon the abscissa line, while the number of cases, whose upper tone-limit corresponds to any of the given divisions of the scale, is laid out upon the ordinate.

Both from the form of each of these curves, with their varying point of culmination, as also from their remarkably close agreement with each other (in analyzing the curves we

must remember that Siebenmann has examined young people alone, while my investigations embrace individuals of all ages), we are justified in drawing the conclusion that the test with the Galton whistle gives a greater danger of error than was formerly appreciated by myself and many others, on account of the confusion arising from the blowing noise.

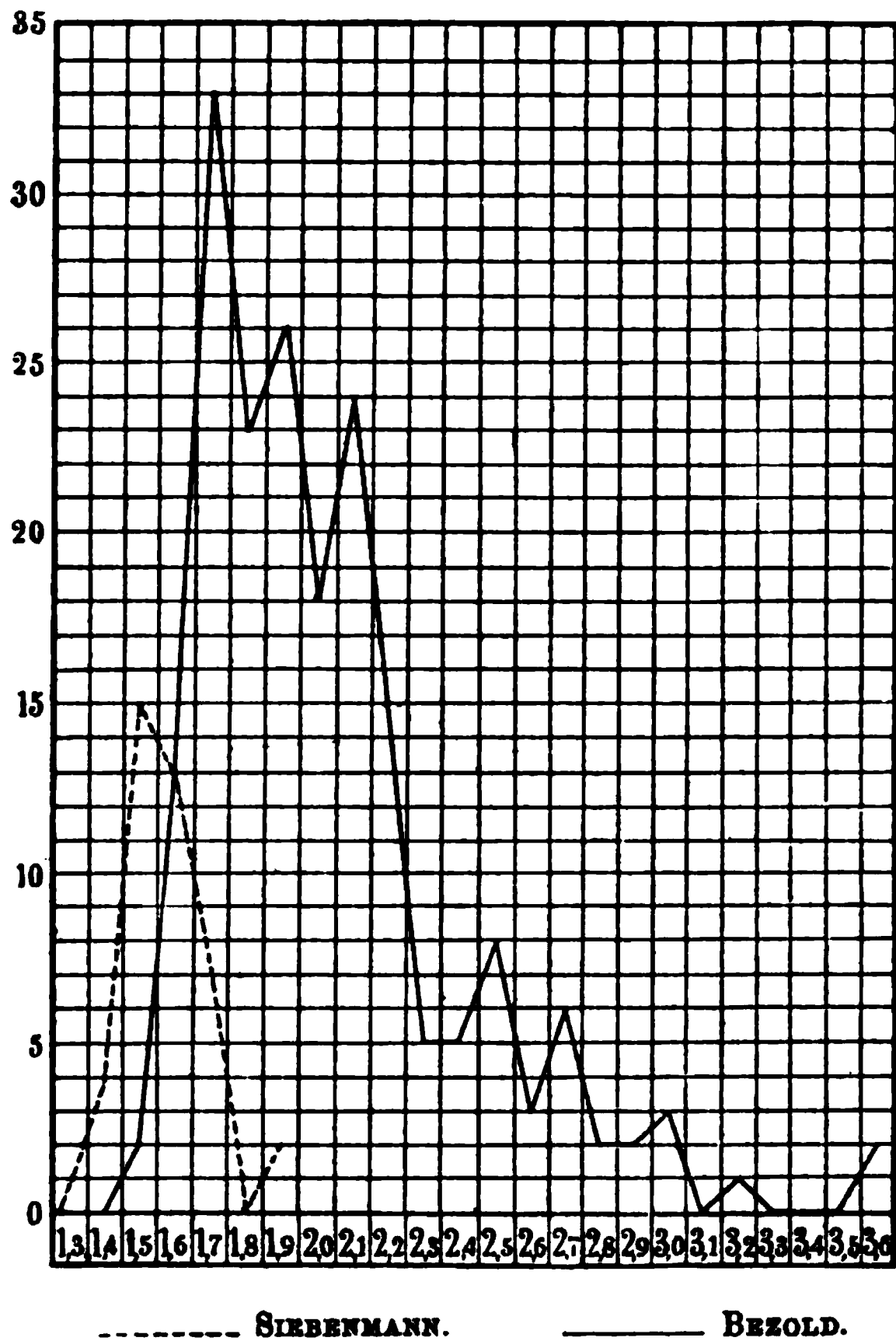


FIG. I.

The accuracy of the audition of those tested, should consequently be confirmed. When the limit is neared, we successively make the note of the whistle lower; if the subject signifies that in response to this the whistle is heard more distinctly, then the limit has been passed by. A second means of control is to interpose each time, between the

uppermost notes of the whistle, a pure blowing sound, by screwing the instrument up for a greater distance. It is always advantageous to confirm the result several times.

The influence of age upon the upper tone-limit is shown in the table, which gives the successive height of the tone-limit in divisions of the scale of the Galton whistle, in the various years of life, from ten to twenty years, up to sixty or more years. The hiatus at the upper portion of the scale, which takes place usually in advancing years, is quite per-

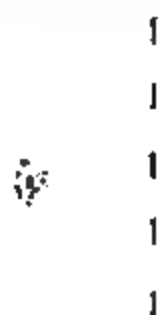


FIG. 2.

ceptible, but by no means as marked as it appears from the investigations of Zwardemaker. Until the very late period of life, not in a single instance was a half division of the twelve parts of the Galton scale lost, through the advancing period of middle age. Also the lowering of the upper tone-limit was found not to be regularly progressive; individuals from twenty to thirty years and from fifty to sixty years of age were found to hear higher notes than those of the preceding decade.

If we turn now to the record of the individual statistics of the lower tone-limit in the different years of age, and the changes therein, it must be certain, above everything else, that the tuning-fork employed is free from any accompanying sounds, and devoid of overtones. If we cover the eyes of the patient, and cause him to tell us in every case when sound was first perceived, errors in this test are excluded. Consequently the results portrayed in the curve shown in Fig. 2, drawn from the statistics secured in the above manner, present much more forcibly than we have found to be the case in the curve representing the upper tone-limit.

Had this curve been drawn with an equally large number of subdivisions, the highest point would lie five times as high as in the figure. The descent upon one side is very abrupt, gradually becoming lost, with moderate variations, in the zero line. These variations also would probably no longer have existed, in spite of the only moderately large number of individuals examined, had it not been that in most cases only the vibrations represented by even numbers were recorded, since these alone were marked upon the fork, as irregularities are present in the curve for vibrations represented by odd numbers only.

The lowest row of figures, which gives the successive lower tone-limit found at different periods of life, in double vibrations of the Appunn tuning-fork, shows, as in the case of the upper limit, an increasing narrowing with advancing years. It is, however, neither pronounced nor uniformly progressive. From 10 to 50 years, the loss at the lower end of the scale amounts to scarcely half a vibration (.48); from 50 to 60 or older, it amounts to 2.72 vibrations. If we reflect upon the changes and diseases which influence the ears until advanced life is reached, these alone would serve to explain the small defects found both at the upper and lower end of the scale, and we need not accept of necessity a senile degeneration. Indeed, they are not at all comparable with the impairment of vision in old age, which, according to the investigations of De Haan, sinks almost one half from 10 years to 80 years of age.

A distinct narrowing of our scale of hearing, both at the

upper and lower portions, exists in only a very slight degree as the result of age alone, and not distinctly attributable to other causes.

Quite different is the state of the acuteness of audition for our entire hearing power, of which we obtain the most complete evidence through the test with speech. That the power of perception for this undergoes a distinct loss in advanced life, as Haan has found for the sight, will be brought out by a further series of experiments, the labor of which busies me now.

As an average upper tone-limit for the Galton whistle, the investigations of 190 cases of all ages has given this as 2.03 (for males, 2.02; for females, 2.05) upon the scale of the instrument. The average lower tone-limit was reached at 17.04 double vibrations per second (for males, 17.16; for females, 16.90). Hence they differ from distinctly pathological cases, whose lower limit lies at 43 double vibrations. Males were of somewhat more acute hearing for the highest portions of the scale, while females were of more acute hearing for the lowest portion than the other sex; it is entirely possible, however, that these insignificant differences will disappear in a more complete series of experiments.

A fact of greater importance is presented, however, by the limited series of experiments recorded here. If we compare the curve found for the upper tone-limit, as determined by either Siebenmann or myself, with the curve of the lower tone-limit, the two first show us that our limit of audition, at least for the tone intensity produced by the Galton whistle, falls completely within the limits of this instrument; the curve obtained from the low tuning-fork of Appunn, however, representing the lower tone-limit, shows us at the first glance that we have not reached the lower tone-limit of the normal human ear with the 16 vibrations of this fork, for in this instance the curve stops suddenly at its highest point, although we should expect, with certainty, the unequal prolongation of the curve in both directions to the zero line, as has been exhibited in both other curves for the upper limit.

MISCELLANEOUS NOTES.

BRITISH MEETINGS OF SOCIETIES.

MEDICAL SOCIETY OF LONDON.—At the clinical evening on January 30th, Mr. Lockwood showed a case of symmetrical gangrene of the auricles, simulating Raynaud's disease. The condition was not the result of frost-bite, but the pupils were sluggish and unequal, suggesting a trophic nerve lesion. The question of treatment was discussed by Mr. Marmaduke Sheild, Drs. Cautley, Guthrie, and Eddowes, and the president [Mr. Hutchinson] made some remarks on causation and the value of small doses of opium.

WEST LONDON MEDICO-CHIRURGICAL SOCIETY.—At the clinical meeting held on December 2, 1892, Mr. Richard Lake showed a boy aged six, on whom he had operated for cholesteatoma of the mastoid antrum penetrating the posterior fossa of the cranium. The recovery was uninterrupted.

ROYAL ACADEMY OF MEDICINE IN IRELAND—SURGICAL SECTION.—Mr. Doyle brought forward two cases of disease of the mastoid and petrous portions of the temporal bone in connection with diseases of the ear. In one case a direct communication had been formed with the middle fossa of the cranium, producing softening and abrasion of the under surface of the temporo-sphenoidal lobe.

BRITISH LARYNGOLOGICAL AND RHINOLOGICAL ASSOCIATION.—At the quarterly meeting held on December 9, 1892, Dr. Milligan showed a patient on whom, by his advice, Mr. Thorburn had laid the left nasal cavity freely open and removed a large sarcomatous mass attached to the middle turbinated bone. Twenty years ago, and again seven years previously to the present operation, nasal polypi had been removed, and Dr. Milligan raised the question as to whether the malignancy of the growth was not in some way dependent upon the irritation consequent

upon these operations. The patient was a single woman aged forty-five. In the discussion which followed, Drs. George Stoker and Sandford, and Mr. Bark of Liverpool, related somewhat similar cases of recurrent nasal growths. Dr. Milligan also showed a case of malignant disease of the tonsil in a man aged forty-nine.

At the annual meeting held on December 10th Professor Von Schroetter of Vienna and Dr. F. H. Bosworth of New York were unanimously elected honorary members.

MANCHESTER MEDICAL SOCIETY.—At the meeting held on November 16, 1892, Dr. Milligan made some observations upon excision of the auditory ossicles in cases of chronic suppuration of the middle ear. He claimed for this proceeding that it enabled him (1), to rid the tympanum of the focus of disease and secure thorough drainage, and (2), to improve the hearing. A case was shown in which marked improvement had resulted.

MANCHESTER CLINICAL SOCIETY.—At the meeting on December 20, 1892, Dr. Milligan showed several patients suffering from naso-pharyngeal adenoids, and a discussion upon several points connected with the condition ensued. Dr. Milligan considered that the disease should be looked upon as the local manifestation of a dyscrasia closely allied to scrofula, and advocated early removal.

ANDERSON'S COLLEGE MEDICO-CHIRURGICAL SOCIETY.—At the meeting held on December 10, 1892, Professor MacIntyre M.D., read a paper on diseases of the throat and nose.

NORTHUMBERLAND AND DURHAM MEDICAL SOCIETY.—At the meeting on November 10, 1892, Dr. Robertson showed two cases in which he had drained the antrum of Highmore on each side for old-standing disease with good results.

BRITISH MEDICAL ASSOCIATION.—The annual meeting will be held at Newcastle-on-Tyne on Tuesday August 1, 1893, under the presidency of Dr. G. B. Philipson, Professor of Medicine in the University of Durham, and senior physician to the infirmary.

Arrangements have this year been made for a separate section in Otology, of which Mr. H. B. Hewetson of Leeds has been appointed president; Mr. R. Ellis and Dr. Bronner, vice-presidents; Dr. Mackenzie Booth of Aberdeen and Mr. Macaulay of Newcastle, honorary secretaries.

The following special subjects have been proposed for formal discussion: 1. *The Surgical Treatment of Mastoid Disease and its*

Complications. To be opened by Professors William Macewen, M.D., Glasgow; Victor Horsley, F.R.S., London; A. Ogston, M.D., Aberdeen; and Dr. Guye, Amsterdam. 2. *Pathogenic Organisms of the Naso-Pharynx and Ear.* To be opened by Dr. Macintyre, Glasgow.

YORKSHIRE BRANCH.—At the meeting held at Harrogate on November 2, 1892, Dr. Adolf Bronner read a paper on "Some Common Diseases and Tumors of the Naso-Pharynx."

SOUTHEASTERN BRANCH—WEST KENT DISTRICT.—At the meeting held at the Kent and Canterbury Hospital on November 24, 1892, Dr. T. Eastes of Folkstone read a paper on post-nasal adenoids, insisting upon the importance of early removal and recommending the use of forceps, supplemented by scraping with the finger nail.

ROYAL COLLEGE OF SURGEONS.—The Bradshaw lecture on the surgery of the nose and accessory cavities delivered by Mr. Christopher Heath of the Royal College of Surgeons on December 1, 1892, is not remarkable for any particular novelty with regard either to the pathology or treatment of the affections referred to. It is chiefly noticeable for the fact that Mr. Heath took the opportunity of deprecating the work of those who had devoted particular attention to this particular subject, and of expressing the somewhat astonishing opinion that the general surgeon "owes little or nothing to the specialist"!! It is of course extremely easy to make such assertions as these, more especially when there is not any danger of the lecture being subjected to the rigors of debate and discussion.

An ingenious ear syringe is depicted in the *Lancet* of December 24, 1892, by Messrs. Wright & Co., of New Bond Street. The syringe is of the ordinary "ball" pattern, and its main features appear to be that the nozzle is very short, and consequently cannot be thrust too far into the meatus, and it is also furnished with an ingenious arrangement for securing a return flow of the fluid injected.

The Spring term of the London Post-Graduate course commenced on January 16th and terminated on March 11th; it in-

cluded a series of lectures and demonstrations at the London Throat Hospital by Drs. Whistler, Law, and Woakes, and Messrs. Stewart and Stoker. The Summer term commences on May 1st, and ends on June 24th.

APPOINTMENTS.

BARRON, B. J., M.B., has been appointed physician to the throat and nose department of the Bristol General Hospital, Eng.

FULLARTON, R., M.D., appointed lecturer on diseases of the throat and nose at St. Mungo's College, Glasgow, Scotland.

LITTLE, A., M.B., C.M., appointed ophthalmic and aural surgeon to the Victoria Hospital, Burnley, Eng.

MILLIGAN, W., M.D., has been appointed lecturer on diseases of the ear at Owens College, Manchester, Eng.

PAN-AMERICAN MEDICAL CONGRESS.

SECTION ON OTOTOLOGY.

The executive officers are :

Executive President : Dr. C. M. Hobby, Iowa City, Iowa.

Secretaries for the U. S. :

Dr. Max Thorner (English-speaking), Cincinnati, O.

Dr. H. McHatton (Spanish-speaking), Macon, Ga.

Book Reviews.

Lehrbuch der Ohrenheilkunde. By A. POLITZER. Dritte gänzlich umgearbeitete Auflage. 619 pages, 331 illustrations. Stuttgart: F. Enke, 1893.

The third German edition of Politzer's famous text-book is most carefully revised and extensively re-written. The author, whose merit in the development of modern otology is unexcelled by any one man, has personally cultivated every part of this special field (the dimensions of which are so rapidly extending), and followed the progress of its growth most conscientiously. This shows on every page. In many text-books the first edition only is brought up to date, and the more editions follow, the more behind-times the book is apt to become. Such is not the case with the work under consideration. The ambitious author, whose working power is astonishing, omits no opportunity to remain the first in the rank. For this reason, the present edition of his text-book appears the clearest, truest, and most complete presentation of the actual state of otology. The book is sure to hold the ground even in competition with the forthcoming cyclopedia of Schwartze, for a work of one author, who masters the whole field, has the advantage of conciseness, uniformity, and harmonious treatment of the subject.

H. K.

New York Eye and Ear Infirmary Reports. Vol. I., part 1. Jan., 1893. G. P. Putnam's Sons. Price, \$1.25.

The N. Y. Eye and Ear Infirmary, the oldest and largest institution of its kind in America, shows its progress not only in the increase of its charitable work, but also in placing the medical experience it furnishes to its staff, students, and visitors at the

reach of the profession at large, by publishing, at irregular intervals, a collection of papers based on observations and investigations made in the hospital and laboratory. The first number, consisting of seven ophthalmological and seven otological papers (which will be analyzed in our systematic report on progress), introduces the publication with the following statement :

“The Surgical Staff of the N. Y. Eye and Ear Infirmary, desiring to make known the professional work of the several departments of the Institution, have decided to publish a small volume of original articles which will appear at intervals as material shall be collected.

“PUBLISHING COMMITTEE : Richard H. Derby, M.D., Chairman ; Gorham Bacon, M.D.; Frank L. Ives, M.D.; William S. Dennett, M.D., Secretary ; John E. Weeks, M.D., Editor.

EDITORIAL NOTICE.

The increasing number of valuable papers offered to us makes it impossible to publish in an unabridged translation all articles of the one edition in the other. In the future all papers of the one will be announced in the other as soon as they have appeared, and translated as soon and as extensively as practicable. Those of our readers who, for parallel examination, verification of certain statements, or minute study, desire to recur to the original, will have a loan-copy sent to them by applying to one of the editors (S. Moos, Heidelberg, for English originals ; H. Knapp, 26 West 40th Street, New York, or U. Pritchard, 3 George Street, Hanover Square, London, for German originals).

H. KNAPP, S. MOOS, U. PRITCHARD.

the first time deep pressure and percussion over the mastoid, which was still free from redness and swelling, caused the patient to say it was *slightly* tender.

On these grounds, which seemed to me at the time rather slight, I recommended operative interference. The next day, Doctors Alderton and Simmons assisting, I cut down on the bone, and, finding no soft spot, began with the chisel. At the first tap with the mallet, the chisel perforated the bone as if it were a mere egg-shell. A large quantity of pus, seemingly from one to two ounces, escaped. A large portion of the external cortex was removed, and an enormous cavity found containing, beside the pus, much granulation tissue. While curetting this away there was a sudden large flow of venous blood, which, however, soon ceased with pressure, and the curetting was carefully finished. Then on gently using the probe to more thoroughly investigate the condition of the inner wall of the mastoid, at one point, with scarcely more than its own weight, it entered the cranial cavity a distance of $2\frac{1}{2}$ –3 inches. The mastoid cavity was then gently syringed out with carbolic solution (1–40), the fluid passing from behind forward through *Mt* and canal, and *vice versa*—the wound carefully dried, and packed with iodoform gauze.

The after-oozing was very slight. For four days the patient did well, the highest temperature being 99.4° . On the morning of the 27th, at 9 o'clock, temp. 98.4° ; at 11.30 A.M., however, patient woke out of sleep with a severe chill which lasted an hour. When I saw him at 12.30 chill was just passing off, and temp. was 102.5° . Dressing at once removed and cavity syringed out. After drying it was found with the probe that the inner, bony wall of the mastoid cavity was absent for a space as large as an ordinary 25-cent piece, leaving only a membranous separation of the large pus cavity from the brain, and in this membrane were plainly seen the two points at which it had been punctured during the operation, once with the curette into the sinus, the other time with the probe into the cranial cavity. That evening, temp. 100.4° —the next morning 98.4° —twice after that 99.4° —with these exceptions never again above normal. From that time there was an uninterrupted, though slow, recovery, the patient being discharged cured August 12, 1892.

On September 16th, one month later, patient returned at Dr. McCorkle's request, with the history that during the past month he had had repeated attacks of vertigo, having twice fallen and

lost consciousness. On several occasions had barely avoided falling by quickly grasping something or sitting down. During the attacks face becomes bluish-pale, breathing frequently irregular, pulse very slow. When in the office pulse 30 to 36. The attacks are not attended with increased tinnitus, or impairment of hearing. I gave the opinion that attacks were not in any way connected with the ear. Heard two or three months later that the patient had entirely recovered his usual health under simple tonic treatment.

On April 24, 1893, Mr. W. called upon me. Reports himself in good health. *Mt* is quite opaque and slightly retracted. H.D., w. $\frac{c}{60}$, whisper 5', conversation 35'.

The interesting features of this case seem to me to be: (1) The relatively slight symptoms preceding, and indicating operation, compared with the enormous destruction of tissue within the mastoid, involving even a large portion of the inner wall, as well as the absence of any serious consequences from the double puncture, into the lateral sinus, and into the brain cavity. (2) The severe chill on the fourth day after operation, preceded by no unpleasant symptoms, and followed by an uninterrupted recovery. I am inclined now to believe that, had I dressed the wound a day earlier, even this might have been avoided. (3) The attacks of vertigo with loss of consciousness, irregular respiration, and slow pulse during the month following the final healing. My subsequent thought on this subject has crystallized into this query: In the absence of a bony wall between the mastoid and cranial cavities, could the cicatricial contraction have caused sufficiently increased intra-cranial tension to account for the symptoms?

CASE 2.—Miss E., æt. twenty-one, came to my clinic at the Brooklyn Eye and Ear Hospital, March 14, 1893. She gave a history of discharge from the right ear for two months, preceded, and accompanied, by severe pain in and behind the ear, and somewhat over the side of the head, and always worse at night.

Examination showed H.D., w. $\frac{0}{80}$, whisper 7'. Tuning-fork from vertex in right ear, in which it is better heard by bone- than by air-conduction. Auricle pushed considerably outward from

side of head ; behind it a large, red, very tender swelling, extending downward about one inch from the level of the upper margin of auricle (patient says this has existed only two or three days) ; posterior and superior canal walls bulged considerably into the canal, which is filled with pus ; *Mt* only partially visible, but perforation whistle results from inflation of the middle ear. Recommended immediate operation, which was done the following day, March 15th, in the presence of Drs. Alderton and Simmons.

The tissues overlying the bone were very much infiltrated ($\frac{1}{4}$ –1 inch thick), periosteum loosened, surface of bone much roughened, but with no overlying pus. At one point the bone was greatly softened ; on commencing to curette this with a sharp spoon, I found the whole outer cortex could be scooped away in this manner, no chisel being needed. A large opening was thus made, with the escape of considerable pus ; a large amount of granulation and necrotic tissue was curetted away, observing, however, the utmost caution, since I had, on finding the cortex so diseased, remarked the danger of opening the sinus in such a case. Finally, while clearing out the upper, inner, and posterior part of the cavity, the assistant was drying it out with a pledget of cotton, on removing which there was a large flow of dark venous blood. Further proceedings were stopped, the cavity firmly plugged with cotton while the parts were cleansed, and after its removal was packed tightly with iodoform gauze, covered with plenty of cotton and a tight bandage.

Oozing not more than ordinary. First dressing March 17th, no hemorrhage, wound looking well, lightly syringed, and packed with gauze. Highest temperature recorded was 24 hours after operation, 100.6°. Pain entirely relieved. At the second dressing, March 20th, the perforation of *Mt* was found healed. Left the hospital to become an out-door patient, March 31st.

Recovery has, considering the external swelling, the amount of necrosed bone, etc., before operation, been rather unusually rapid, there having been no untoward symptoms, the patient being discharged, with the wound entirely healed, June 5th.—H.D., w. 30', whisper and conversation 40+'.

In this case the prominent features are : (1) the manner in which the sinus was apparently opened—*i. e.* the flow of blood came after removing a pledget of cotton used for drying out the cavity. It seems probable that with the

curette a piece of necrotic bone was made to wound the sinus wall, but was not sufficiently displaced to allow of hemorrhage until caught in the cotton and removed. (2) The entire absence of disturbing symptoms, with relatively short time required for entire healing of the wound.

Just as I was finishing the report of the above cases, I was called upon to operate upon a case of mastoiditis, which proved to be my third case of opening the sinus. The history follows:

CASE 3.—Mrs. McL., æt. fifty-five, came to me at the Brooklyn Eye and Ear Hospital, May 12, 1893. She reports herself as convalescent from a recent attack of "grip,"—has had for two weeks severe pain localized behind the right auricle, with constant pulsating tinnitus, and some hardness of hearing.

Present condition: H.D., w. R $\frac{1}{4}$; L $\frac{1}{8}$; whisp. R 5', L 4'. Tuning-fork, from vertex better in right ear. In both, bone-conduction better than air-. Over the right mastoid, where the pain is located, is a distinctly localized point of tenderness to both pressure and percussion. Right canal, normal; moderate redness of *Mt*, especially marked over attic and hammer handle. Left canal, walls somewhat irritated; outer layer of *Mt* white and loosened, masking an underlying markedly red *Mt* and slight bulging of the postero-superior quadrant.

Treatment, gentle inflation; two leeches over tender part of right mastoid, one in front of left tragus. Cold locally to right mastoid. The inflammation in the left ear yielded readily to this treatment without rupture of the *Mt*. In right side, the redness of attic and handle subsided somewhat, but the mastoid pain and tenderness, although yielding temporarily to the blood-letting, were practically unchanged up to May 20th, on which date operation was decided upon and performed in the presence of Drs. Simmons, Waugh, and Butler.

Pus was found immediately under the cortex in a few of the superficial cells, and I believe that the operation might just as well have been concluded at this point. I decided, however, to work inward toward the antrum. While doing this, and when well forward, close to the posterior wall of the external auditory canal, there was the flow, not at first very profuse, but constantly increasing, of dark venous blood, indicative of opening of the lateral sinus. The wound was packed with cotton during cleans-

ing, and then with gauze, and tightly bandaged. No more than ordinary after-oozing. Highest temp. 99:6°, the day following the operation. Pat. left the hospital June 5th, and the wound is now healing rapidly. Hearing about normal in both ears.

It is a rather curious fact that in this case the mastoid suppuration occurred on the side upon which there was apparently a lesser grade of inflammation in the tympanic cavity. The tympanic inflammation was certainly much greater, when the patient was first seen, upon the left side. The fact of the pus being found *only* in a few of the superficial cells coincides with the idea expressed by Politzer in his article, "De l'ouverture de l'apophyse mastoïde, etc., à la suite de l'influenza," in the *Annales des maladies de l'oreille, du larynx*, etc., for May, 1892, viz.: "It is very important to know that these cavities" (a certain class he is describing) "hardly ever communicate with the mastoid antrum; the abscess is nearly always isolated. . . . Further, one must never in these cases seek to establish an artificial communication between the abscess cavity and the antrum," etc. From my experience with this and two or three other similar cases, I certainly believe with Politzer that an extension of the operation to the antrum is in certain cases at least superfluous, if not indeed worse.

It is difficult for me to explain how the sinus was opened in this case;—at the time, the curette was well forward toward the antrum, and no great force was being used. The only plausible explanation that occurs to me is that with the curette I may have splintered the inner plate, the posterior end of the splinter penetrating the sinus wall.

The case is further unusual from having no severe, indeed only a very slight, inflammation of the tympanic cavity, without at any time a perforation of the membrana tympani.

SHORT DESCRIPTION OF THE TEMPORAL BONES OF DEAF-MUTES BELONGING TO THE PATHOLOGICAL MUSEUM OF THE COPENHAGEN UNIVERSITY.

By HOLGER MYGIND, COPENHAGEN.

THE collection of temporal bones of deaf-mutes in the Pathological Museum of the University of Copenhagen, which collection, as far as the number of preparations and the care with which they are made are concerned, is certainly unique, has not, up to the present—at least outside Denmark—received the attention it deserves as yielding an important contribution to the morbid anatomy of deaf-mutism and ear diseases in general.

Several authors have described single specimens or the more important. Four of them formed the basis of an article by Mürer¹; E. Schmalz² makes a short mention of them (in all seven preparations).³ Further, the description of the preparations contained in the University catalogue has been partially reproduced by Bremer,⁴ where there were abnormalities in the bony parts of the hearing organs. Bremer's description was unaccompanied by any information concerning the history of the deaf-mutes, as he had been unable to discover the catalogue of the preparations in

¹ Mürer: *De causis cophoseos surdo-mutorum indagatu difficilibus commentatis brevis sectionibus cadaverum ut plurimum illustrata.* Havniæ, 1825.

² Schmalz, E.: *Kurze Angaben der pathologischen Veränderungen der Gehörorgane, welche von einigen andern Aerzten bei der Section Taubstummer gefunden worden sind.* Beiträge zur Gehör-und Sprachheilkunde. Leipzig, 1848, S. 164–167.

³ Bremer, Victor: *Om det pathologiske Fund hos døvstumme.* Kjøbenhavn, 1880.

the archives of the Royal Copenhagen Deaf-and-Dumb Institution, to which the University catalogue refers (all the deaf-mutes in question having been inmates of this institution) in the heading and at each single preparation; hence his work lost much in value, many of the conclusions drawn being incorrect, a fact which has been plainly proved by Mygge.¹ Thanks to the latter author, the value of the collection has been considerably increased, as he, from information which he found in the medical reports in the archives of the said Deaf-and-Dumb Institution, was able to make up for the supposed loss of the catalogue, and thus collect information as to the history of most of the deaf-mutes whose temporal bones are contained in the collection. Mygge at the same time brought together particulars as to the origin and history of the collection. Finally, the author of this article has several times had occasion to mention several of the preparations, and has also published a short description of the most important abnormalities which they exhibit.²

Mygge's description of the preparations of the temporal bones of deaf-mutes in the Pathological Museum in his above-mentioned article is the most exhaustive that has as yet been published. It embraces all those temporal bones which have afforded positive results on investigation as to existing abnormalities, and also gives information as to the history of the deaf-mutes themselves. Mygge has, however, considered himself bound only to give a reproduction of the descriptions of the preparations as given in the catalogue of the Museum and the archives of the Copenhagen Royal Deaf-and-Dumb Institution. As, however, the descriptions of these two literary sources disagree on several points concerning different abnormalities, and a closer investigation proved that important abnormalities were entirely omitted, whilst others were incorrectly or deficiently explained, and as, finally, several errors had crept into the

¹ Mygge : Nogle Bemaerkninger om Studiet af hørestumhedens Ætiologi og Pathogenese, fremkomne i Anledning af Dr. V. Bremer's Afhandling, "Om det pathologiske Fund hos hørestumme; særligt i baumark."—*Ugeskrift for Læger*, 4de Række, Nr. 22.

² Mygind : "Uebersicht über die pathologisch anatomischen Veränderungen der Gehörorgane Taubstummer."—*Archiv für Ohrenheilkunde*, Bd. 30, S. 76.

descriptions which have been published, I have been induced to bring forward this important collection in its entirety. I must, however, add that I have not considered myself authorized in making any further preparation of the specimens. I have not, therefore, been able to submit all the parts of the organs of hearing belonging to the temporal bone to so minute an investigation as I could have wished, owing to the way in which some of the specimens are prepared. Further, I have everywhere made use of the descriptions mentioned above as a basis for my work, especially in describing such abnormalities the nature of which might be dubious, particularly when there might be a question of these having been produced in preparing the specimen; for instance, absence of the drum-head, the ossicula auditus, etc.

I have had no difficulty in collecting material for the history of the collection, as Mygge had already paved the way in the above-mentioned work, by the investigations he had made in the archives of the Copenhagen Deaf-and-Dumb Institution, which were kindly placed at my disposal by Pastor Heiberg, the director of that establishment.

From the archives it appears that the collection originated in Mürer (who was a medical attendant to the Deaf-and-Dumb Institution of Copenhagen from the 29th of April, 1823) making a post-mortem examination of a deceased inmate, No. 7, Christian Henrik Sophûs Bølle Leonhardsen, died April 16, 1824, whose left temporal bone, No. 10 in the catalogue of the Pathological Museum, was prepared by Lieutenant-Surgeon Laurent.

From a paper by Mürer addressed to the Committee of the Institution it would appear that this post-mortem, which is elsewhere described by Mürer in the paper mentioned above, was performed by order of the committee, who also decided that the organs of hearing should be prepared and preserved in the Institution. There is also a paper which seems to prove that the committee was careful that its orders were carried out. The next specimens in the collection, which, in this way, was originally connected with the Deaf-and-Dumb Institution, are both temporal bones of

a deceased pupil, No. 22, Louisa Augusta Danielsen, died the 7th of June the same year. Laurent prepared these specimens as well. His receipt for 16 *Rigdaler* (32s.), which was his fee (including glass case and turned stand), is to be found in the archives. The post-mortem was, however, performed by Mackeprang, who was Mürer's *locum tenens* at the Institution at that time, and also house-surgeon at the Copenhagen General Hospital, where the deaf-mute died. These two specimens, which are also mentioned by Mürer in his paper, showed no abnormalities on investigation; they are numbered 54 and 55 in the Museum collection. It seems that no post-mortem was performed on deceased pupils for some time. This was not owing to a want of interest in the matter, as several papers of the archives speak of the ineffectual efforts that have been made to induce parents of deceased pupils to allow of post-mortems being performed. On the 11th of February, 1826, Mackeprang, who in the meantime had become medical attendant to the Institution, again performed a post-mortem, and the temporal bones were removed and prepared. In the ten years subsequent, Mackeprang performed post-mortem examinations on a large number of deaf-mutes from the Institution, most of whom died at the General Hospital, where M. was house-surgeon until 1848. As a rule, he removed the temporal bones for preparation as specimens. According to Mygge's investigations, it was highly probable that the preparation of these temporal bones was entrusted to Dr. Ibsen, whose great skill as preparator is evinced by the care and delicacy with which the task was performed. A further proof that it is to Ibsen that we owe the specimens, is afforded by his paper on investigations of the labyrinth,¹ which appeared several years after his death, and in which he says: "A considerable collection of specimens of organs of hearing, which has been presented to the Anatomical Museum of the University by the Deaf-and-Dumb Institution, and the readiness with which Dr. Mackeprang, medical

¹ T. Ibsen: Anatomiske Undersøgelser over Orets Labyrinth. Splultet af Foofalteren i 1846, nu udgivet paa Carlsbergfondets Behostuing af P. L. Panum. Kjöbenhavn, 1881.

attendant to the Institution, has allowed me to assist in the post-mortem of pupils, have given me opportunity to observe," etc.

A couple of specimens (No. 18 and 19) are, however, not the work of Ibsen, but, according to Mackeprang's report of the death of the deaf-mute in question, were made by Mr. Larsen.¹ This probably refers to Larsen, later head-surgeon to the Copenhagen General Hospital, who was at that time appointed as interne there. These specimens, however, differ in no wise from the others, as far as the mode of preparation is concerned. The last post-mortem reported by Mackeprang to the committee took place in 1837.² It was in 1837 that Ibsen was appointed Professor of Anatomy at the Copenhagen University, and it is probable that his time from then was too much occupied to allow him to prepare specimens which, to judge from their appearance, have certainly been no slight undertaking: By placing the deaf-mutes, whose organs of hearing Mackeprang reports as being removed post-mortem, in chronological order according to the date of their death, we obtain a list of fifty-seven deaf-mutes, and fifty-seven is the highest number in the lost catalogue, to which the Museum Catalogue refers in a couple of specimens.

The fact that so large a number of post-mortem examinations could be performed at the Deaf-and-Dumb Institution in so short a time, proves that its medical attendant, Mackeprang, who performed nearly all, took a lively interest in scientific matters, which is the more remarkable, as post-mortems on deaf-mutes were then, and for some time later, rare occurrences. It is, therefore, principally owing to him that the

¹ It is a remarkable circumstance that Mackeprang makes no mention of Ibsen's name. The reason is perhaps that the latter, according to the account books of the Institution, which, however, give no name, received payment for his work, which amounted to about 10 Rigsdaler (= £1) for each pair of specimens.

² Mygge has not been able to prove from the archives whence the two last specimens came, but believes them to belong to deaf-mutes examined post-mortem in 1843 and 1844, as Mackeprang does not mention the removal of organs of hearing in his annual medical reports in 1837-1842, whilst the reports for 1843-44 are missing from the archives. A closer investigation shows that Mackeprang mentions the removal of the organs of hearing, as far as the deaf-mute examined by post-mortem in 1837 is concerned, in his *monthly* reports, though not in his annual.

Copenhagen University is in possession of such a large collection of temporal bones of deaf-mutes. As a great number of these specimens showed no abnormalities, it was to be expected, that Mackeprang would have found pathological changes on examining the auditory nerve or the brain. Of these he makes no mention in his reports, he everywhere uses the expression "the soft parts of the organs of hearing offered nothing abnormal." This, it seems, can only be explained by supposing the examination to have been deficient in this respect.

By the request of Professor Fenger, the collection was, in 1844, presented by the Deaf-and-Dumb Institution to the Pathological Museum of the Copenhagen University "to serve as an important aid in the education of future medical men." A written catalogue was then made of all the specimens, which were placed in case A. In this catalogue the specimens were renumbered. It is impossible to discover what order was followed in this re-arrangement, but it is evident that specimens exhibiting abnormalities received a low number, whilst those exhibiting no abnormalities received a higher number in the order in which the deaf-mutes died, and were mentioned in the lost catalogue. Besides, some specimens were labelled with the full name and date of death of the deaf-mute in question, and the description of each specimen in the Museum catalogue refers to a certain number in that of the Deaf-and-Dumb Institution. As mentioned above, it has been possible to reconstruct this catalogue with the help of Mackeprang's medical reports to the Committee of the Deaf-and-Dumb Institution, which reports, when the investigations of the temporal bones give a positive result, contain a description of the abnormalities found. These descriptions are, in many cases, word for word the same as the corresponding ones in the Museum catalogue; in many cases the two descriptions do not differ so much as to cause any doubt as to the identity of the specimens in question. As Mackeprang's reports say nothing as to the cause of deafness in the cases in question, neither as to the deaf-mute's place of residence, etc., I have been unable to glean anything from them in this respect. But Mackeprang

always gives the deaf-mute's number in the books of the Institution, and as these contain ample particulars it has been possible to obtain the information which is given below as to each separate deaf-mute.

The collection contains 110 specimens (not including one which was added several years later and owning another origin). Each of these is the preparation of one temporal bone. In all cases except two (Nos. 11, 15 and 59), the labyrinth is opened either by several sections or by chiselling out the bony walls. The first method is employed in specimens 10 and 11, 12 and 13, 14 and 15, 16 and 17, 57 and 58, in which cases a saw has, without doubt, been used; the second is employed in all the remaining cases. In the latter mode of preparation the bony walls have been partially chiselled away to afford a view of the cavities of the labyrinth. This chiselling has been performed so as to perfectly preserve the form of the labyrinth, without, on the other hand, as a rule, hindering a full view of the labyrinthal cavities and the pathological changes they so often contain. The specimens are numbered from 10 to 119 and are arranged so that each even number, with the following odd number, represents a pair of temporal bones from the same individual. The collection then consists of specimens taken from 55 deaf-mutes.¹

NO. 10 AND 11.

Pupil No. 7. Christian Sophûs Henrik Bølle Leonhardsen. Born March 11, 1813, in Veiløe Parish, Præstø County. Entered May 3, 1821. According to the mother's account *became deaf when two years old*, the result of an *acute fever*. Died April 16, 1824, of tuberculosis.²

¹ As Mackeprang in his report speaks of the removal of the temporal bones of fifty-seven deaf-mutes, it will be seen that two pairs are missing. The first of these belonged to pupil No. 2, Dorothea (Clausdatter, who was the first pupil on whom post-mortem was performed. According to a bill found in the archives this specimen was preserved in spirit in a jar. The other pair belonged to pupil No. 42, Jens Redersen, No. 51 of those examined post-mortem. Mackeprang states that the external auditory canal was narrowed and that membrana tympani and the ossicula auditus were wanting. Both pairs of specimens seem to have been lost.

² Under the heading "Tuberculosis" are included in the following all diseases in the various organs mentioned in the post-mortem as "scrophulous swellings," "suppurating glands," etc.

No. 10. Left temporal bone. Membrana tympani and ossicula auditus present and of natural appearance. All the semicircular canals are closed in their central $\frac{2}{3}$ by a bony mass, which without any sharp boundary line unites with the surrounding bone, but differs from this, having a more spongy appearance. The openings of the semicircular canals into the vestibule appear as a short *cul-de-sac*.

No. 11. Right temporal bone. This bone has not been prepared, excepting that the tympanum has been opened from above. The malleus and incus are present and of natural appearance. Membrana tympani and stapes have been lost in or after preparation.¹ (The two specimens are described by Mürer, see above.)

NO. 12 AND 13.

Pupil No. 8. Ane Marie Christensdatter. *No information as to the cause of deafness.* Born in the parish of Starup in the county of Veile ; christened January 8, 1809. Admitted November, 1819. Died February 11, 1826, of tuberculosis.

No. 12. Right temporal bone. Only the internal wall of the tympanum is visible ; the rest, including the ossicula auditus and membrana tympani, having been removed. Only the cavity of the first turn of the cochlea is plainly visible ; in its commencement is a distinct lamina spiralis, nothing in its termination. The upper end of the first turn opens into a large cavity, which occupies the entire remainder of the cochlea, and in which there is no trace of the modiolus. At the top of this cavity is the trace of a rim attached to the wall, which is the remains of the partition wall between the first and second turns, and which completely divides the cavity into a larger under and a lesser upper division.² On the posterior surface of the petrous bone is a deficient ossification of the parts lateral to the aquæductus vestibuli and reaching to fossa sigmoidea ; the external wall of the posterior semicircular canal is thus laid bare for the greater part, appearing as a horn, narrower above and broader below. The aquæductus vestibuli is somewhat wider than normal.

¹ When stating that membrana tympani and ossicula auditus are wanting as the result of preparation, this, here and in the following, is supposed to be the case, as this want is not mentioned in the catalogue.

² According to remarks in the catalogue it would appear, that it was at first doubtful whether the absence of the partition wall in the left ear, which was the first prepared, was not due to sawing, but as far as the right ear was concerned it is stated : "A more careful preparation proves that the partition wall is missing."

No. 13. Left temporal bone. Exhibits the same abnormalities as the right ; the lamina spiralis, however, retains its size throughout the first turn.

NO. 14 AND 15.

Pupil No. 17. Nick Pedersen Fogh. Born May 5, 1809, in the parish of Holme, Aarhus County. Admitted June 4, 1824. According to the clergyman of the parish the child was *born deaf*. Neither of the parents deaf and dumb ; the mother insane and separated from her husband on that account. A sister who died when six years old was born deaf. Died April 6, 1826, of tuberculosis.

No. 14. Left temporal bone. Membrana tympani, malleus, and incus are present, stapes lost (in preparation). The aquæductus vestibuli, wider than normal, especially outwards towards the petrous bone. There has doubtless been the same abnormality in the posterior surface of the petrous bone as mentioned in the description of the right temporal bone, but the preparation does not permit a more minute investigation.

No. 15. Right temporal bone. Membrana tympani and malleus visible. The aquæductus vestibuli same as left. On account of deficient ossification, the external wall of the posterior semicircular canal is visible on the posterior surface of the petrous bone, though not so distinctly as in specimens 12 and 13. The labyrinth is otherwise neither opened nor chiselled out.

NO. 16 AND 17.

Pupil No. 32. Paul Henricksen, born 1811 in Skagafjord, Iceland. Admitted September, 1820. According to his brother's account, the boy *became deaf when four years old after an illness* ; intelligent and one of the best scholars. Died January, 1827, of tuberculosis.

No. 16. Left temporal bone. Stapes deformed, the two normal crura being missing. Fenestra ovalis present, leading to a small hour-glass-shaped cavity, which in height and position corresponds to the vestibule. In the tympanum is an opening corresponding to the fenestra rotunda, leading to a small cavity whose course, however, cannot be traced owing to mode of preparation. There is no further trace of the normal cavities of the labyrinth, as the whole petrous bone is formed of a firm osseous tissue, which in the parts corresponding to the normal seat of the

labyrinth is harder and whiter, though the contour of the labyrinth cannot be distinctly made out. The meatus auditorius internus somewhat narrow; in the bottom of it is one opening which in shape, size, and position corresponds to the normal for the nervus facialis; there is no trace of foramina cribrosa.

No. 17. Right temporal bone. Exhibits principally the same abnormalities as the left. The cavity corresponding to the vestibule is, however, somewhat larger and more triangular. On account of the mode of preparation nothing can be distinctly stated as to the fenestræ ovalis and rotunda. The contour of the cochlea is in one place plainly visible in the osseous mass.

NO. 18 AND 19.

Pupil No. 35. Reder Madsen. Born April, 1810, in the parish of Semmerbølle, Svendborg County. Admitted December 16, 1892. *No information as to the cause of deafness.* Died September 12, 1828, of tuberculosis.

No. 18. Left temporal bone. Membrana tympani and ossa auricula present. Vestibule unopened. Meatus auditorius internus somewhat wider than normal.

No. 19. Membrana tympani removed, ossicula auditus present. The middle third of the posterior semicircular canal, and about the middle half of the external semicircular canal are filled with a firm, white, ivory-like osseous substance.

NO. 20 AND 21.

Pupil No. 8. Ane Nielsdatter, born August 4, 1817, in the parish of Breininge, Ringkjøbing County. Admitted March 29, 1827. According to the clergyman's certificate she was *born deaf*, as nothing is known that could have caused the deafness; none of her relations were deaf-mutes. Died of tuberculosis March 6, 1829.

No. 20. Left temporal bone. Excepting that the meatus auditorius internus is somewhat narrowed, there is no abnormality.

No. 21. Right temporal bone. Exhibits the same abnormality as left, but in lesser degree.

NO. 22 AND 23.

Pupil No. 14. Christen Redersen. Born February 13, 1814, in the parish of Oelstgkke, Fredericksborg County. Admitted July

6, 1822. According to the parents, *deaf from birth*. Died March 12, 1829, of tuberculosis.

No. 22. Left temporal bone. Not the least trace of the posterior semicircular canal. Vestibule considerably diminished in size. Crura ampullaria of the superior and external semicircular canal are united into one canal. Meatus auditorius internus does not present itself as a canal in the bone, but as a broad, flat hollow, in which there is a large opening leading to the first turn of the cochlea.

No. 23. Right temporal bone. Exhibits the same abnormalities as the left. The opening communicating between the cochlea and the above-mentioned hollow is even larger than in the left bone.

NO. 24 AND 25.

Pupil No. 13. Reder Larsen. Born December 24, 1821, in the parish of Hellebach, Fredericksborg County. Admitted July 1, 1829. According to the clergyman's certificate was *born deaf* and has a deaf-and-dumb brother. No other deaf-mutes in the family. The books of the Institution show, however, that there was a younger deaf-and-dumb sister, who died later at the Institution, and whose temporal bones form specimens 52 and 53 of this collection. Died October 26, 1829, of pleuritis and nephritis suppurativa.

No. 24. Left temporal bone. Membrana tympani and ossicula auditus present. Modiolus and lamina spiralis disappear entirely in the second turning, and the partition between the second and third turnings is wanting, a large cavity being thus formed in the top of the cochlea, whilst the base is occupied by the whole of the first and a part of the second turning, the internal osseous structure of which is normal. Aquæductus vestibuli much wider than normal.

No. 25. Right temporal bone. Exhibits the same appearance as the left; aquæductus vestibuli, however, cannot be seen owing to the method of preparation.

NO. 26 AND 27.

Pupil No. 37. Jon Thorkelsen, born 1812 in Shagestrand, Iceland. Admitted August 20, 1884. *No information as to cause of deafness*. Whilst in the Institution was attacked by tussis convulsiva and morbilli. Died, February 23d, of pleuritis and pericarditis, resulting from scarlatina.

No. 26. Left temporal bone. Membrana tympani and ossicula auditus present (stapes, however, has been lost by the preparation). The middle $\frac{2}{3}$ of the posterior semicircular canal are filled by an osseous mass, which in nowise differs from the surrounding bone. The external opening of aquæductus cochleæ is situated on the posterior surface of the petrous bone and is much extended ; the canal itself is closed.

No. 27. Right temporal bone. Membrana tympani and ossicula auditus present. The inferior $\frac{2}{3}$ of the posterior semicircular canal closed as on the left side. No abnormality in the external orifice of aquæductus cochleæ, but the canal itself is probably closed.

NO. 28 AND 29.

Pupil No. 5. Hans Johansen. Born April 8, 1821, in the parish of Flödstrup, Swendborg County. Admitted July 1, 1829. According to the clergyman's certificate, was *born deaf* ; neither of the parents, nor any of their other children, were deaf-and-dumb ; was intelligent ; died March, 5, 1830 of tuberculosis.

No. 28. Left temporal bone. Membrana tympani and ossicula auditus present. Modiolus and lamina spiralis disappear after the formation of $1\frac{1}{2}$ turnings of the cochlea. The partition between the remaining turnings is missing ; there is in this way formed a large cavity in the top of the cochlea, in which a low ridge is visible, the remainder of the partition wall ; the base of the cochlea is occupied by the whole first and half of the second turning, the interior osseous structure of which is normal, excepting that the scala vestibuli is much wider than normal. The semicircular canals are much narrowed. The aquæductus vestibuli somewhat wider than usual.

No. 29. Right temporal bone. Exhibits the same abnormalities and conditions as the left.

NO. 30 AND 31.

Pupil No. 3. Iver Iversen, born December 18, 1820, in the parish of Hartse, Vejle County. Admitted July 30, 1828. Was *born deaf*, according to the certificate from parochial authorities, but neither his parents nor his only brother were deaf-mutes. Whilst in the Institution was attacked by morbilli. Died April 20, 1830, of tuberculosis.

No. 30. Left temporal bone. Tympanum high and narrow with only a trace of the promontorium. Membrana tympani and

ossicula auditus are wanting. The entrance to the Eustachian tube is completely closed, as is also the case with canalis tensoris tympani, and the entrance to antrum mastoideum. The state of the two fenestræ cannot be clearly decided, but a large upright fissure is visible leading from the tympanum and vestibule to the cell-like cavities mentioned below. The external semicircular canal is filled in the central $\frac{1}{3}$ by an osseous mass, which does not differ from the surrounding bone in appearance or consistency. The anterior crus of the superior semicircular canal is of the width proper to the canal, whilst the posterior crus is completely filled by a spongy osseous mass, the small cavities of which seem to be in connection with cellulæ petrosæ, which are strongly developed outwards towards the tympanum, the place of which is partially occupied (see above). The state of the vestibule cannot be decided owing to the mode of preparation.

No. 31. Right temporal bone. Tympanum of a good size, with distinct promontorium; both fenestræ plainly visible and of normal appearance; membrana tympani and ossicula auditus wanting. The middle $\frac{1}{3}$ of the posterior semicircular canal completely filled by a chalk-like mass.

NO. 32 AND 33.

Pupil No. 34. Marie Hansdatter, born March 17, 1818, in the parish of Naesby, Praestö County. Admitted August 10, 1828. According to the clergyman's certificate, she *was able to hear and speak until two and one half years old, when she had morbilli* followed by considerable swellings (round the ears?), with the formation of ulcerations which took a long time to heal; from this time the child lost the power of hearing and speaking. Neither of the parents nor their other children are deaf-mutes. Died March 17, of tuberculosis.

No. 32. Left temporal bone. Membrana tympani and ossicula auditus, with the exception of stapes, are wanting (result of preparation?).

No. 33. Right temporal bone. Membrana tympani and ossicula auditus are wanting; the post-mortem showed signs of caries in the tympanum. The middle third of the exterior semicircular canal is filled by an osseous mass; the anterior crus of the superior semicircular canal is much narrowed by the deposit of osseous substance in the canal's middle wall, the width of the canal thus receiving a laterally bent direction. The osseous sub-

stance deposited in both canals does not differ in appearance or consistency from the surrounding bone.

NO. 34 AND 35.

Pupil No. 59. Niels Larsen. Christened August 31, in the parish of Hörby, Hjörring County. Admitted June 27, 1827. According to the clergyman's certificate, *he became deaf after an illness, when six years old*, after which his speech by degrees became indistinct; neither of the parents, nor any of their other children, were deaf-mutes; was intelligent. Died May 17, 1831, of tuberculosis.

No. 34. Left temporal bone. Membrana tympani and stapes are wanting (which is doubtless lost in preparation or afterwards).

No. 35. Right temporal bone. Membrana tympani and stapes are wanting (doubtless lost in preparation or afterwards). The condition of the two fenestræ cannot be distinctly seen, owing to the mode of preparation. The vestibule and the three semicircular canals are entirely filled by a very firm white osseous mass. The cavity of the first turning of the cochlea is filled by a firm white mass which is something between a chalky and an osseous substance.

NO. 36 AND 37.

Pupil No. 49. Rasmus Madsen, born February 5, 1815, in the parish of Feldballe, Handerst County; admitted May 6, 1825. According to the sheriff's certificate, neither of the parents, but an elder brother was a deaf-mute (and it seems to have been supposed that he himself was *born deaf*). Died August 20, 1831, of tuberculosis.

No. 36. Left temporal bone. The modiolus and lamina spiralis are wanting in the cochlea from the middle of the second turning; the first and half the second turning are present and the interior osseous structure is normal, excepting that the scala vestibuli is somewhat wider than natural, and the lamina spiralis somewhat diminished in size. The rest of the cochlea is occupied by a cavity in which, as mentioned above, the modiolus is wanting, but in which a remainder of partition wall, resembling a thin bone beam, stretches up towards the top of the cochlea. Aquæductus vestibuli wider than normal.

No. 37. Right temporal bone. Is the same as the left excepting that scala vestibuli is widened at the expense of scala tympani,

and that lamina spiralis is more rudimentary towards the end of the first $1\frac{1}{2}$ turning.

NO. 38 AND 39.

Pupil No. 9. Maren Sudersdatter, born March 28, 1818, in the parish of Vistofte, Randerst County, admitted July 30, 1828. According to the clergyman's report the parents had only had one child before the birth of the deaf-mute, which child died when eight months old ; neither of the parents are deaf-mutes ; *became deaf when one and one half years old, the result of an illness.* Had morbilli whilst at the Institution. Died December 10, 1831, of meningitis.

No. 38. Left temporal bone. Membrana tympani and ossicula auditus present. The labyrinth of normal appearance.

No. 39. Right temporal bone. Membrana tympani and ossicula auditus present. An osseous mass, which in appearance and consistency does not differ from the surrounding bone, fills the following parts of the semicircular canals, viz., the middle one fourth of the posterior, and the superior from the middle and half-way down its posterior crus.

NO. 40 AND 41.

Pupil No. 35. Johanne Dorthe Nielsdatter, born January 22, 1818, in the parish of Brylle, Odense County ; admitted August 11, 1828. According to the clergyman's certificate neither of the parents are deficient in speech or hearing, but besides this deaf-mute daughter have also had a deaf-mute son ; both were, according to the parents, *born deaf*, whilst the remaining three children can hear. Died December 27, 1831, of tuberculosis.

No. 40. Left temporal bone. Membrana tympani and ossicula auditus present. The superior part (about $\frac{1}{4}$ of the canal's length) of the posterior semicircular canal is completely filled with a substance resembling both a calcareous and osseous mass, and which by its color and softer consistency is easily discernible from the surrounding bone.

No. 41. Right temporal bone. Membrana tympani and ossicula auditus present. No abnormalities in the labyrinth.

NO. 42 AND 43.

Pupil No. 24. Reder Jörgensen, born in the parish of Paarup, Odense County ; christened September 20, 1815 ; admitted

September 15, 1825. According to the certificate of two men in the parish, he was not born deaf, but *lost his hearing during an illness when five and one half years old*. Neither of the parents were deaf-mutes. Died January 3, 1832, of tuberculosis.

No. 42. Left temporal bone. Membrana tympani and ossicula auditus wanting (according to catalogue, destroyed by caries), which disease is also mentioned in post-mortem as having been present in the tympanum (Mackeprang: *Traces of caries in cavum tympani*). The labyrinthal wall of the tympanum unrecognizable on account of flat osseous deposits; fenestra ovalis closed by an osseous mass. The entrance to antrum mastoideum closed. The following semicircular canals are filled with a hard, white osseous substance which, without any sharp boundary line, becomes part of the compact osseous mass of which the petrous bone is built, viz.: the entire superior canal, with the exception of a small portion in the upper part of crus anterior, close to the middle of the canal, thus forming a cavity of the size of a pin's head; the entire external canal, which has, according to the catalogue, an abnormal curve (preparation?); the upper half of the anterior canal, with the exception of a small portion, which is perfectly open, thus forming a cavity of the size of a largish pin's head. Only traces of the vestibule are visible in the form of a small round cavity. The petrous bone is very firm and hard. Aquæductus vestibuli wider than normal.

No. 43. Right temporal bone. Traces of caries were visible in the tympanum on post-mortem. Membrana tympani and ossicula auditus are wanting (destroyed by the above-mentioned carious process, according to the catalogue). Otherwise nothing abnormal.

NO. 44 AND 45.

Pupil No. 6. Ane Dorthe Jacobsdatter, born in the parish of Lennaa, Skanderborg County; christened June 30, 1816; admitted July 20, 1825. According to the clergyman's certificate *could speak until her fifth year, when she became dumb as the result of measles*. Neither of the parents, nor any of the other children, were deaf-mutes. Died March 18, 1882, of tuberculosis.

No. 44. Left temporal bone. Membrana tympani wanting (removed in preparation?); ossicula auditus present; walls of the tympanum normal, excepting that the fenestra rotunda is closed in its depth by an osseous mass, which does not differ in

construction from the surrounding bone. The state of the vestibule cannot be decided, owing to the mode of preparation.

No. 45. Right temporal bone. The same as left.

NO. 46 AND 47.

Pupil No. 5. Ane Kristine Andersdatter, born July 17, 1817, in the parish of Veilly, Vejle County ; admitted August 22, 1822. According to the clergyman's certificate the parents declare that *she became deaf when six months old, the result of convulsions due to teething*, owing to which deafness she had always been dumb. Neither of the parents have suffered from deafness. The child was remarkably intelligent. Died July 6, 1832, of tuberculosis.

No. 46. Left temporal bone. Membrana tympani wanting (doubtless the result of preparation). Ossicula tympani present. Superior and anterior semicircular canals filled in their middle thirds by an osseous mass ; the external canal is narrowed in the middle corresponding to $\frac{3}{4}$ of its extent.

No. 47. Right temporal bone. The same abnormalities, but the external canal is less narrowed.

NO. 48 AND 49.

Pupil No. 12. Ingeborg Andestatter. Born July 4, 1818, in the parish of Hürüp, Thisted County. Admitted August 26, 1827. The father stated in a written declaration that in February, 1825, *the child (then 6½ years old) after going out in a severe storm became suddenly ill with headache and violent vomitings in which worms were thrown up. Became unconscious after three days' violent pain ; consciousness returned on the fourth, but fourteen days elapsed before she could walk. The power of hearing was lost.* Blisters were applied, but to no purpose, as the patient tore them off ; warm milk was also syringed into the ears to no avail. Speech imperfect, but remembers written letters and can thus be taught to pronounce. None of her family are deaf-mutes. Died May 18, 1823, of tuberculosis.

No. 48. Left temporal bone. Membrana tympani wanting (lost in preparation), stapes wanting (from the same reason) ; both fenestræ present and normal in appearance, both leading to the same small cavity, which cannot be more closely examined on account of the mode of preparation, but which is doubtless the vestibule, or its remains. All the semicircular canals and the cochlea are filled with a firm, white, osseous mass, which does not

differ from the surrounding bone, either in appearance or consistency ; the cochlea is chiselled out as a round solid projection.

No. 49. Right temporal bone. The same as left, excepting that membrana tympani and stapes are present.

NO. 50 AND 51.

Pupil No. 37. Maren Nielsdatter. Born March 14, 1817, in the parish of Dover, Skanderborg County. Admitted August 29, 1828. None of her family were deaf-mutes ; according to the clergyman's certificate, *she is supposed to have lost her hearing in early childhood*. Had scarlatina whilst in the Institution. Died October 19, 1833, of tuberculosis.

No. 50. Left temporal bone. Membrana tympani missing (probably the result of preparation); the ossicula auditus present. Normal.

No. 51. Right temporal bone. Membrana tympani wanting (probably the result of preparation); crus longum incudis wanting; stapes wanting.

NO. 52 AND 53.

Pupil No. 35. Marie Olivia Elizabeth Larsdatter. Born April 17, 1827, in the parish of Hellebach, Fredericksborg County. Admitted October 1, 1835. Must be considered as *born deaf* according to the clergyman and doctor's certificates. Neither of the parents deaf-mute; an elder brother still living is deaf-mute, as was also an elder brother who died in the Institution and whose temporal bones form specimens No. 24 and 25. Died May 8, 1837, of tuberculosis.

No. 52. Left temporal bone. Membrana tympani and ossicula auditus present. The modiolus and lamina spiralis cease entirely in the middle of the second turning, and the partition wall between the second and third turnings is wanting, the result being the formation of a large cavity in the top of the cochlea; whilst its base is occupied by the whole first and half of the second turning, the interior osseous structure of which is normal. Aquæductus vestibuli much wider than normal. (The catalogue remarks: "This preparation was not a success.")

No. 53. Right temporal bone. Membrana tympani wanting, (doubtless removed in preparation); ossicula auditus present. The condition of the cochlea the same as in left side, with the addition of the following abnormalities: scala vestibuli in the

existing parts of the cochlea much wider than usually ; in the large cavity in the top of the cochlea is a narrow beam, which proceeds slantingly from the upper part of the remaining modiolus to the interior surface of the cochlea ; this beam is probably the remains of the ruined partition wall.

NO. 54 AND 55.

Pupil No. 22. Louisa Augusta Danielsen. Born in Copenhagen, June 5, 1814. Admitted October 1, 1823. Was, according to her doctor's certificate, *born deaf*. Died June 7, 1824, of tuberculosis.

No. 54. Left temporal bone. Normal.¹

No. 55. Right temporal bone. Normal.

NO. 56 AND 57.

Pupil No. 41. Anders Nielsen. Born December 3, 1815, in the parish of Visby, Thisted County. Admitted June 11, 1824. *Born deaf*, according to certificate from the county authorities ; no attempt made to cure him. Died May 25, 1826, of tuberculosis.

No. 56. Left temporal bone. Normal.

No. 57. Right temporal bone. Normal.

(The partition wall in the upper part of the cochlea is, however, wanting, thus forming a large cavity ; but as neither Mackeprang nor the Museum Catalogue mention this abnormality, it is presumably owing to preparation.)

NO. 58 AND 59.

Pupil No. 13. Margrethe Larsdatter. Born 1811, in the parish of Gundsleo, Maribo County. Admitted July, 1820. *No information as to cause of deafness*. Died 1826, of tuberculosis.

No. 58. Left temporal bone. Normal.

No. 59. Right temporal bone. Not prepared.

NO. 60 AND 61.

Pupil No. 18. Carl Frederick Eegholm. Born April 14, 1819, in Branders. Admitted April 6, 1827. *Born deaf*, ac-

¹ This remark, here and in the following, is made use of even when examination shows the membrana tympani or ossicula auditus to be wanting, but where it is probable that this was the result of preparation, as Mackeprang in his reports says that there was no abnormality in the temporal bones, which statement is repeated in the Catalogue.

according to certificate from the dean of the county. None of his family are deaf-mutes. Had morbilli whilst in the Institution. Died March 6, 1829, of tuberculosis.

No. 60 and 61. Both temporal bones. Normal.

NO. 62 AND 63.

Pupil No. 63. Anders Pedersen. Born in the parish of Rødding, Viborg County; christened November 16, 1816. Admitted August 10, 1827. *Born deaf*, according to certificate signed by two men living in the parish. Neither of the parents nor their other children deaf-mutes; a brother very deaf with a difficulty of speech. Died March 24, 1829, of tuberculosis of the brain.

No. 62 and 63. Both temporal bones. Normal.

NO. 64 AND 65.

Pupil No. 18. Mine Fransine Jensen. Born 1813, in the parish of Gjentofte, Copenhagen County. Admitted 1821. *No information as to cause of deafness*. Had morbilli whilst in the Institution. Died July 6, 1829, of tuberculosis.

No. 64 and 65. Both temporal bones. Normal.

NO. 66 AND 67.

Pupil No. 39. Nette Johanne Kundsatter Quist. Christened March 29, 1818, in the parish of Olsted, Vejle County. Admitted September 14, 1828. *No information as to cause of deafness*, the parents leading a roving life. Died January 18, 1830, of tuberculosis.

No. 66 and 67. Both temporal bones. Normal.

NO. 68 AND 69.

Pupil No. 27. Christian Hansen Fjeldsted. Born July 12th, in Copenhagen. Admitted October 1, 1823. *No information as to cause of deafness*. Died March 16, 1830, of tuberculosis.

No. 68 and 69. Both temporal bones. Normal.

NO. 70 AND 71.

Pupil No. 32. Ane Hansdatter. Born December 8, 1816, in the parish of Aadum, Ringkjøbing County. Admitted September

13, 1827. According to clergyman's certificate, is said by parents to have been *born deaf*. None of her family are deaf-mutes. Had morbilli whilst in the Institution. Died March 31st, of tuberculosis.

No. 70 and 71. Both temporal bones. Normal.

NO. 72 AND 73.

Pupil No. 57. Jörgen Andersen. Born April 1, 1815, in the parish of St. Jörgen, Svendborg. The clergyman of his parish states that the boy *could hear until six years old, when he lost his hearing and his left eye in morbilli* (the father says scarlatina), and has since been delicate ; by degrees lost the power of speech ; his brother has endeavored to teach him to spell, to no purpose. Otherwise in enjoyment of his intellectual faculties. He has a twin sister who can hear. Died May 5, 1830, of tuberculosis.

. No. 72 and 73. Both temporal bones. Normal.

NO. 74 AND 75.

Pupil No. 2. Frederick Emil Engelbrechtsen. Born May 5, 1820, in the parish of Copenhagen. Admitted April 30, 1827. The brother declares him to have been *born deaf*, but the defect was first discovered when he was one and one half years old. Had morbilli whilst in the Institution. Died June 19, 1830, of tuberculosis.

No. 74 and 75. Both temporal bones. Normal.

NO. 76 AND 77.

Pupil No. 52. Anders Nielsen. Born 1816, in the parish of Vargod, Ringkjøbing County. Admitted June 22, 1825. *Born deaf*, according to clergyman's certificate. The parents have three younger children, neither of whom, nor the parents, are deaf-mutes. Had tussis convulsiva and morbilli whilst in the Institution. Died September 7, 1830, of tuberculosis.

No. 76 and 77. Both temporal bones. Normal.

NO. 78 AND 79.

Pupil No. 15. Kirstine Marie Jensdatter. Born March 10, 1820, in the parish of Webber, Aalborg County. Admitted, September 14, 1829. The parents declare her to have been *born deaf*.

Neither of the parents, nor their other children, are deaf-mutes. Died January 13, 1831, of tuberculosis of the brain.

No. 78 and 79. Both temporal bones. Normal.

NO. 80 AND 81.

Pupil No. 45. Karen Rasmusdatter. Born March 8, 1819, in the parish of Dannemarre, Maribo County. Admitted, May 9, 1829. *Born deaf*, according to the clergyman's certificate, the same being the case with a brother three years younger. Neither of the parents deaf-mute. Died January 29, 1831, of tuberculosis.

No. 80 and 81. Both temporal bones. Normal.

NO. 82 AND 83.

Pupil No. 11. Ane Hansdatter. Born November 24, 1817, in the parish of Nordby, in the island of Fano. Admitted May, 1827. The mother declared the child to have been *born deaf*, as it had never been able to speak and never had any illness. Neither of the parents, nor their two elder sons, were deaf-mutes. Had morbilli whilst in the Institution. Died March 3, 1831, of tuberculosis.

No. 82 and 83. Both temporal bones. Normal.

NO. 84 AND 85.

Pupil No. 40. Kirstine Sörens datter. Born in the parish of Thyrs ted, Vejle County ; christened March 11, 1818 ; admitted September 25, 1828. *Born deaf*, according to clergyman's certificate. Died March 17, 1831, of tuberculosis.

No. 84 and 85. Both temporal bones. Normal.

NO. 86 AND 87.

Pupil No. 41. Ellen Larsdatter. Born November 20, 1819, in the parish of Egebjerg, Holbæk County ; admitted November 4, 1828. *Born deaf*, according to clergyman's certificate. Neither of the parents deaf-mute. A younger brother born deaf. A younger sister speaks and hears deficiently ; might be said to be a deaf-mute. Had morbilli whilst in the Institution. Died March 28, 1831, of tuberculosis.

No. 86 and 87. Both temporal bones. Normal.

NO. 88 AND 89.

Pupil No. 2. Kund Jörgensen. Born September 25, 1822, in the parish of Ostrup, Odense County. Admitted July 1, 1830. *Born deaf*, according to clergyman's certificate, and can only hear shouting into the ear. The parents have had a deaf-born daughter since the son's admission to the Institution. Died April 9, 1831, of tuberculosis.

No. 88 and 89. Both temporal bones. Normal.

NO. 90 AND 91.

Pupil No. 51. Wilhelm Valdemar Thomassen. Born November 13, 1816, in Slagelse. Admitted June 3, 1825. *Born deaf*, according to sheriff's certificate. No other member of the family deaf-mute. Died October 28, 1813, of tuberculosis.

No. 90 and 91. Both temporal bones. Normal.

NO. 92 AND 93.

Pupil No. 3. Jens Jensen. Born, September 14, 1821, in the parish of Skambz, Odense County. Admitted July 1, 1830. According to the clergyman's certificate, the mother declares the child to be *born deaf*. No other member of the family deaf-mute. Died, December 14, 1821, of tuberculosis.

No. 92 and 93. Both temporal bones. Normal.

NO. 94 AND 95.

Pupil No. 32. Christen Clausen. Born June 7, 1817, in the parish of Hohnstrup, Holbæk County. Admitted February 19, 1827. The clergyman's certificate declares him to have *become deaf during an illness in his 2d year*. Had morbilli whilst at the Institution. Died February 20, 1832, of tuberculosis.

No. 94 and 95. Both temporal bones. Normal.

NO. 96 AND 97.

Pupil No. 3. Magdalene Nielsdatter. Born September 16, 1816, in the parish of Förslov, Sorö County. Admitted July 11, 1825. *Born deaf*, according to clergyman's certificate. Neither of the parents, or their other children, deaf-mute. Had morbilli whilst in the Institution. Died April 12, 1832, of tuberculosis.

No. 96 and 97. Both temporal bones. Normal.

NO. 98 AND 99.

Pupil No. 2. Jens Christian Pedersen. Born May 19, 1823, in the parish of Hore, Ringkjöbing County. Admitted July 3, 1831. *Born deaf*; three deaf-mute brothers and sisters. Neither of the parents deaf-mute. Died July 13, 1832, of meningitis.

No. 98 and 99. Both temporal bones. Normal.

NO. 100 AND 101.

Pupil No. 36. Ane Margrethe Nielsdatter. Born December 10, 1819, in the parish of Magletz, Svendborg. Admitted August 28, 1828. *Born deaf*, according to clergyman's certificate. The parents have seven children, of whom four are deaf-mutes; no other deaf-mutes in the family. Died November 23, 1832, of tuberculosis.

No. 100 and 101. Both temporal bones. Normal.

NO. 102 AND 103.

Pupil No. 20. Ane Christiansdatter. Born February 11, 1820, in the parish of Mörke, Holbæk County. Admitted July 31, 1828. The parents declare her to have been *born deaf*. No other members of the family deaf-mute. Had morbilli whilst in the Institution. Died June 9, 1833, of tuberculosis.

No. 102 and 103. Both temporal bones. Normal.

NO. 104 AND 105.

Pupil No. 8. Ane Marie Madsdatter. Born in the parish of Skarrild, Ringkjöbing. Christened September 7, 1819. Admitted April 21, 1829. The parents believe her to have been *born deaf*. No other members of the family deaf-mute. Had measles shortly before admission to the Institution. Died August 1, 1833, of tuberculosis.

No. 104 and 105. Both temporal bones. Normal.

NO. 106 AND 107.

Pupil No. 37. Lars Jensen. Born May 22, 1822, in the parish of Greensing, Ringkjöbing County. Admitted October 7, 1833. *Born deaf*, according to clergyman's certificate, but could hear slightly and speak, though only a few monosyllabic words. No other members of the family deaf-mute. Died March 3, 1834, of tuberculosis.

No. 106 and 107. Both temporal bones. Normal.

NO. 108 AND 109.

Pupil No. 16. Steinvor Thordursdatter. Born August 26, 1821, in Iceland. Admitted November 10, 1829. According to certificate from the judge of the district, *became deaf when six months old, the result of an illness*, which is described as causing black spots on the skin, which ulcerated, the illness lasted seven weeks, and was cured without medical assistance. None of the family deaf-mutes. Died July 24, 1834, of tuberculosis.

No. 108 and 109. Both temporal bones. Normal.

NO. 110 AND 111.

Pupil No. 7. Hans Mortensen. Born February 16, 1824, in the parish of Brobz, Odense County. Admitted September 29, 1833. *Born deaf*, according to clergyman's certificate. No other members of the family deaf-mute. Died December 17, 1834, of nephritis during scarlatina.

No. 110 and 111. Both temporal bones. Normal.

NO. 112 AND 113.

Pupil No. 6. Jacob Hansen. Born February 26, 1823, in the parish of Braalg, Sorö. Admitted September 27, 1833. According to schoolmaster's certificate, *became deaf when three years old, the result of scarlatina*. The mother somewhat deaf, but no deaf-mutes in the family. Has some slight hearing, but cannot speak distinctly. Died January 20, 1836, of tuberculosis.

No. 112 and 113. Both temporal bones. Normal.

NO. 114 AND 115.

Pupil No. 31. Hans Mogensen. Born August 24, 1824, in the parish of Faareveile, Holbæk County. Admitted October 1, 1833. *Born deaf*, according to clergyman's certificate. None of the family deaf-mute, but the father deaf, the result of a blow received in childhood. Died May 12, 1836, of tuberculosis.

No. 114 and 115.¹ Both temporal bones. Normal.

NO. 116 AND 117.

Pupil No. 42. Ole Jörgensen. Born May 31, 1826, in the parish of Grönholt, Fredericksborg County. Admitted October 1, 1834,

¹ At the margin of the Catalogue it is added that the ossicula are wanting; the specimen is somewhat damaged.

Born deaf, according to clergyman's certificate. None of the family deaf-mute, so far as is known. Died February 21, 1837, of tuberculosis.

No. 116 and 117.¹ Both temporal bones. Normal.

NO. 118 AND 119.

Pupil No. 22. Karen Marie Pedersdatter. Born December 9, 1824, in the parish of Skaelbz, Praestö County. Admitted November 1, 1834. According to certificate from the principal medical officer of the district, *he became deaf in his fourth year, after an illness*. No other deaf-mutes in his family. Died March 16, 1837, of inflammation of the brain.

No. 118 and 119. Both temporal bones. Normal.

On examining this large collection of preparations of the temporal bones of deaf-mutes, the following results seem worthy of mention. First, the osseous parts of the auditory organs in more than one half of the cases are not the seat of any abnormality that could be pointed out. This is still more remarkable, when we consider that the abnormalities discovered in some cases cannot be supposed to have influenced the hearing of the deaf-mute in question to any important extent (specimens 14 and 15, 20 and 21), or have existed only on the one side (Nos. 19, 33, 35, 39, 40 and 51). Our present knowledge of the morbid anatomy of deaf-mutism leads us to suppose that the above is owing to too much attention having been paid to the osseous parts, and too little to the membranous parts. The examination of the latter has been without doubt deficient, as Mackeprang does not, in a single case, mention the presence of such anomalies, for instance, atrophy or degeneration of the auditory nerve, absence or other abnormality of the membranous labyrinth, or ankylosis of the stapes is nowhere mentioned, although these anomalies are by no means rare in deaf-mutes. The negative result thus arrived at in a number of cases is particularly frequent in cases concerning deaf-mutes reported as having been born deaf, the temporal bones in 25 out of 33 such cases, *i. e.*, about three-fourths of

¹ At the margin of the Catalogue it is added that the ossicula are wanting ; the specimen is somewhat damaged.

the whole, exhibiting nothing abnormal on either side, while this was the case only with 4 couples of specimens out of 14 concerning acquired deaf-mutism. The negative result obtained from the examination of the temporal bones of *deaf-born* deaf-mutes is doubtless in accordance with the circumstance, that congenital anomalies in the organs of hearing of deaf-mutes are much less marked, both as to the extent and severity of the primary processes, than the acquired. It is also in connection with the above that in 10 out of 14 cases of acquired deaf-mutism, the pathological changes discovered have been the result of much more extensive and intense processes, than in cases of congenital deafness.

As far as the nature of the abnormalities is concerned, it will be seen that the morbid changes found in the deaf-born are only exceptionally the expression of malformations—or deformities caused by arrest of development (Nos. 14-15, and 22-23), but in the majority of cases they can be explained as the result of foetal inflammatory processes, which have caused a partial destruction of the internal osseous structure of the labyrinth, and in many cases the consequent formation of osseous tissue. The comparatively frequent abnormality, consisting in the destruction of the upper turns of the cochlea, thus causing a large cavity in the top of that organ without the normal osseous contents, or with smaller or larger remains of the same, whilst the lower parts of the cochlea (which has a more substantial modiolus to support itself), completely or almost completely preserved, is a probable result of a destructive foetal inflammatory process (Nos. 12-13, 24-25, 28-29, 36-37, 52-53). In two cases this abnormality was of peculiar interest, as the four specimens belonged to a deaf-mute brother and sister (Nos. 24-25 and 52-53).

Specimens Nos. 30-31 and 40 can be mentioned as examples of how foetal inflammatory processes form the basis of a new formation of osseous tissue following upon the destruction of the interior of the labyrinth. No doubt it may be objected, that the perfect resemblance of the pathological products found in this small number of cases, to those

found in many cases of acquired deafness, speaks more in favor of a post-foetal origin, and that consequently it is more probable that the information concerning the history of the deaf-born deaf-mutes in question was incorrect. However, numerous other post-mortems of deaf-born deaf-mutes prove that the appearance of the formation of osseous tissue, more or less completely filling the labyrinth, is frequently found in the deaf-born, the pathological changes in whose auditory organs often strongly resemble those found in cases of acquired deaf-mutism.

Finally, the examination of these temporal bones of deaf-mutes, whose deafness was acquired after birth, proves that the pathological changes with preponderating frequency consisted in the deposit of osseous matter in the normal cavities of the labyrinth. This deposit was in most cases confined to a single division of the internal ear, and most frequently to one of more semicircular canals; in a few cases it occupied two of the three divisions of the labyrinth, and in a single case all three (No. 16-17). Even when the osseous mass was found in only a single of the three sections of the labyrinth, it was generally only present in parts of that section, sometimes only narrowing the normal cavity, sometimes closing it more or less completely. The osseous mass closing the cavity was often not to be distinguished from the surrounding bone of the pars petrosa either in color or consistency, whilst in some cases it was clearly distinguishable, owing partly to its greater whiteness, partly to its firmer, more ivory-like consistency, and in a few cases to its chalky consistency and color (specimens Nos. 35 and 40). Closely related to the described osseous new formation is the actual chalky substance found in some of the cases, which, as well as the osseous mass, must be undoubtedly considered as the result of infantile otitis intima. In two cases of acquired deafness (Nos. 32-33 and 44-45) the cause is said to have been measles, which, as we know, can produce acute disease of the labyrinth; the history of the other cases, where the deafness was acquired, was not very clear. In only one case (No. 48-49) were the symptoms undoubtedly those of meningitis, which disease is an important cause of

otitis intima in childhood, in which case a new osseous structure is often formed in the labyrinth, as has been proved by several more recent post-mortems of deaf-mutes, and of persons who had become deaf after this disease, especially in its epidemic form.

Although this little survey has only touched on the most important results of an examination of the specimens of temporal bones in the Pathological Museum of the Copenhagen University, it must, I think, be evident that this collection affords a valuable contribution to the morbid anatomy of deaf-mutism, and of ear-disease, in particular labyrinthine disease. It will, therefore, always form one of the ornaments of the Copenhagen University's Pathological Museum, and be a lasting monument to the industry and skill of those to whom it owes its existence.

HYPERTROPHIC CONDITION OF THE TYMPANIC MUCOUS MEMBRANE IN AN INFANT.

By ARTHUR H. CHEATLE, F.R.C.S. LONDON.

(With one drawing.)

A FEMALE child aged eight months was brought in dead to King's College Hospital; death being due, according to the mother's account, to an attack of croup.

On examining the ears, both membranes were found to be intact but bulged outwards by a sero-mucous-looking exudation, and the mucous membrane which was seen through this mass appeared to be of a dull dark-red color. On opening the middle ears from above and removing the yellow viscid material contained therein, the lining mucous membrane on both sides, but more especially on the left, was seen to be much thickened and papillated, completely filling up the cavities, clogging the ossicles, and blocking up the fenestræ; over the membranes the papillary condition was replaced by minute, discrete elevations; several small circular red masses about half the size of a pin's head were found free in the cavities.

Under the microscope, the exudation contained many cast-off epithelial cells. Sections of the mucous membrane showed that the submucous tissue immediately below the lining epithelium was simply a mass of young granulation tissue, *B* (numerous and closely packed small round cells with newly formed vessels amongst them); the lining epithelium remaining in many places intact, *C*; the deeper layer, *A*, retaining its fibrous appearance with small round cells scattered throughout. Sections of one of the small

circular masses showed it to be composed of very vascular granulation tissue, broken at one point, where it had evidently been attached, and devoid of any epithelial lining.

C

FIG. 1.

Transverse Section of the Hypertrophied Mucous Membrane. X 50 diam.

The naso-pharynx was in a slightly granular condition, as was also the upper surface of the soft palate; the rest of the pharynx and soft palate were perfectly normal. The lungs were rather congested, the mesenteric glands were large, Peyer's patches and the solitary glands also enlarged.

The child was markedly rachitic but fairly nourished. No history of tubercle or syphilis could be obtained.

The case appears to have been one of early hypertrophic catarrh commencing *de novo* in the ears, as the condition of the naso-pharynx was comparatively healthy; if all the new tissues had subsequently become organized and contracted, complete deafness and deaf-mutism must have resulted.

For permission to publish this case and for the post-mortem report I am indebted to Professor Norman Dalton.

THE PATHOLOGY OF DEAF-MUTISM.

By JAMES KÉRR LOVE, M.D., GLASGOW.

IN a former paper¹ I have entered with some detail into the question of the hearing power of the 175 children examined by me at the Institution for the Deaf and Dumb at Glasgow, and I now propose to refer to the etiology of the condition ; a subject the study of which appears to have been much neglected in Great Britain.

From the admission-schedules of these children we find that the causes of the deafness are thus defined :

Adventitious or acquired	in 81 cases
Congenital	“ 72 “
Doubtful	“ 22 “

from which it appears that the acquired are more numerous than the congenital cases ; this is not in accordance with most statements, but as these are not checked by personal examination they are of little value. I believe with Roosa² that whenever personal examination by an expert is responsible for the figures, the acquired cases will be found to be more numerous than the congenital.

Of these 175 children, nine were totally deaf, but we find that only two had been rendered so by disease, while seven had been born deaf. On the other hand, among those who distinguish the voice, twenty out of thirty have been made deaf by disease while ten have been born deaf. Taken as a class, then, “congenital” deaf-mutes are deafer than “acquired” deaf-mutes. I notice this point chiefly because Hartmann³ states that the opposite is the case.

¹ These ARCHIVES, vol. xxii., p. 170.

² These ARCHIVES, vol. xiii., p. 67.

³ *Deaf-mutism*. Translation by Cassell's, p. 87.

The hearing power in congenital and acquired deaf-mutes is shown in the following table :

TABLE I.

	Acquired Deafness.	Congenital Deafness.	Doubtful.	Total.
Totally deaf	2	7	—	9
Heard loud noises.....	36	32	13	81
Distinguished voices.....	20	10	3	33
Too young for testing.....	21	22	6	49
Dumb but not deaf.....	2	1	—	3
	81	72	22	175

With regard to the cases of acquired deaf-mutism, the following are the causes upon which the condition is said to depend :

Meningitis and brain fever	. . . . .	13
Convulsions, fits, and teething	. . . . .	7
Falls and injuries to the head	. . . . .	11
Measles	. . . . .	10
Scarlet fever	. . . . .	3
Whooping cough.	. . . . .	1
Other fevers	. . . . .	3
Ear affections proper [suppurative affections]	. . . . .	8
Syphilis	. . . . .	2
Cold	. . . . .	2
Inflammation of the lungs	. . . . .	1
Fright	. . . . .	1
Unknown or unspecified causes	. . . . .	19
		<hr/> 81

In comparing this list with most of those previously published, I have to notice particularly the absence of typhus and cerebro-spinal meningitis. In Hartmann's tables these two diseases rank next to cerebral inflammation as causes of deaf-mutism. In the American table quoted in the *Royal Commission Report*, neither of them are specially mentioned, but in Roosa's table of 147 acquired and congenital cases,

cerebro-spinal meningitis accounts for forty-seven ! Typhus is now a rare disease in Great Britain, and with reference to cerebro-spinal meningitis in the epidemic form, Fagge¹ says : "Scotland, I believe, has been altogether spared by it." The absence of these diseases as causes of deaf-mutism in the west of Scotland is, therefore, not a matter of astonishment. In nearly all statistics, scarlet fever occupies a much more important place than in the above list, and I have no doubt that in this respect my figures are exceptional. In other respects the list represents fairly well the etiology of acquired deaf-mutism.

After deducting the cases due to unknown causes, we have sixty-two in which the cause is definitely stated, and of these twenty, or nearly a third, are cerebral inflammation, convulsions, and fits. If to these we add eleven cases due to injury to the head by falls, etc., we have exactly half of the cases of acquired deaf-mutism for which any cause is given, due to primary mischief in the brain or internal ear, without concomitant disease in the middle or external ear. Some of these may be cases of meningitis in which the mischief has spread to the auditory nerve and its expansion in the internal ear, but I think that meningitis is made to figure too prominently as a cause of deaf-mutism. Some of these cases are probably cases of primary labyrinthitis ending in total or partial destruction of the internal ear, without any brain affection whatever. In children, and even in adults, primary labyrinthitis undoubtedly occurs,² and some of our cases of recovery from apparent meningitis may be thus explained.

Measles accounts for ten of the sixty-two cases. If an additional reason were needed for the compulsory notification of this disease to local authorities, I think it may be found in these statistics of deaf-mutism. Scarlet fever would appear to be less destructive to the hearing of young children in Scotland than measles. This conclusion is contrary to the evidence of both American and German statistics, and for its qualification I append a statement of the concurrence

¹ *Principles and Practice of Medicine*, vol. i., p. 691.

² Gruber, *Diseases of the Ear*, Law and Jewell's translation, pp. 515 to 525.

of infectious diseases amongst the children before their admission to the Institution :

Measles	in 91 of the cases
Whooping cough	" 81 " " "
Scarlet fever	" 31 " " "
Small-pox	" 5 " " "
Diphtheria	" 1 " " "
Typhoid fever	" 1 " " "

This statement of the occurrence of infectious diseases amongst young deaf-mutes is incomplete, as the schedules sometimes give no information at all, but measles appear to attack them about three times as often as scarlet fever, and it also accounts, as is shown in the previous list, for fully three times the number of deaf-mutes.

How these diseases act in producing the higher degrees of deafness it is not always easy to say, but there is very decided evidence to show that the labyrinthine affection in measles is in many cases secondary to the middle-ear affection. Mygind¹ of Copenhagen has described a case in which this was almost certainly the order of events. Moos² has described a similar case and has shown the part played by the micro-organisms in the invasion of the labyrinth. On the other hand, some of my cases point to the invasion of the labyrinth without the intervention of disease of the middle ear. Four of the ten cases in the above list show normal membrana tympani.

Hartmann appears to consider that the deaf-mutism which follows scarlet fever is always caused by a primary affection of the labyrinth, and he states that in nearly all cases of deaf-mutism where this disease has been the cause, he has found normal membranes. In six of my ten cases of measles the membrane was either perforated or otherwise distinctly abnormal, and in only one of the three cases of scarlet fever was it normal. Further, cases have just been published which show that the inflammation in scarlet fever may spread from the middle ear to the labyrinth and may totally obliterate and destroy that organ.³ It may be true that when

¹ These ARCHIVES, vol. xx., p. 310.

² These ARCHIVES, vol. xviii., p. 49.

³ Mygind, These ARCHIVES, vol. xxii., p. 17 ; Moos, p. 64.

we look at all the otorrhœa due to scarlet fever, the percentage ending in deaf-mutism is small, but of the cases of deaf-mutism due to scarlet fever probably a large number depend upon labyrinthine disease due to infection from middle-ear inflammation.

That class of cases described as ear disease proper may be taken as being composed of cases of suppurative median otitis producing deafness in most instances by spreading of the mischief to the internal ear. In two at least of the cases the damage to the middle ear was very extensive. I removed a sequestrum from one ear of one of these children at the Institution, while I performed the same operation for the other child in one of the wards of the Royal Infirmary. In another of these cases suppurative inflammation was going on actively at the time of the examination. The class consists of eight cases, and in most, if not in all, we may assume that the cause of deafness is middle-ear suppuration, unaccompanied at its outset with scarlet fever, measles, or other general complaint. The ravages of suppurative middle-ear disease were seen in a much larger number of cases, but probably the disease in these cases set in after the occurrence of the deafness.

The work of inspection presented two difficulties :

1. The removal of obstacles from the external auditory canal.
2. The fixing of a standard of normal appearance for the tympanic membrane.

Thirty-seven children had their ears plugged with cerumen or a foreign body. The latter consisted of pebbles, a bead, bits of wood, and pieces of cotton wadding. All these were removed, and all the masses of cerumen except those in two cases were also removed; these two children left the Institution before the operation could be done for them.

It is almost impossible to fix a standard for the appearance of the healthy tympanic membrane. Normal hearing is consistent with great variety in the appearances. Politzer¹ found only twenty-five per cent. of normal membranes amongst normal hearing individuals. In Roosa's² examina-

¹ Ocularinspection des Trommelfells. *Wien. Wochenblatt*, 18, 1862.

² These ARCHIVES, vol. xiii., pp. 65-68.

tions of the ears of deaf-mutes, very little at all is admitted as normal. Roosa and Beard, in their short account of the examination of the ears of deaf-mutes, say: "We consider a normal membrane to be a translucent pearly-gray membrane with the head and handle of the malleus distinct, not very prominent however, or projecting much above the plane of the membrane. On the lower segment is a reflection of the light of a general triangular shape, its apex resting on the lower extremity of the handle of the malleus. The angle formed by the membrane with the upper wall of the external auditory canal is 140 degrees."¹ Now in children the membrane exhibits, in cases of normal hearing, even greater variety than in adults, so that the setting up of any rigid standard like the above is not likely to lead to any valuable results. One gets accustomed to associate certain appearances with certain diseased conditions, and a large clinical experience gives a wider and truer idea of what is normal or abnormal than the application of any rigid standard. In examining these cases, therefore, I applied no absolute standard to the membrane. All perforations, all marked opacities, and all very distinct alterations in thickness, in color, or in curve were considered abnormal. But a membrane was not called abnormal merely because the cone of light varied a little from the triangular, or because the malleus was slightly more prominent than my idea of the strictly normal. Again, the distinction between the remains of suppurative and non-suppurative lesions cannot always be rigidly drawn, but all perforations, cicatrices, and pronounced calcareous changes were put down as due to suppurative diseases.

Both membranes were always examined, and both ears tested. But the testing of the ears separately by the tuning-fork on the forehead and mastoids has not given such definite results in my hands as in Roosa's. The statements of a deaf-mute about his sensations when the handle of a tuning-fork is vibrating on his forehead should be received with the greatest caution. None but the most intelligent deaf-mutes understand the nature of a relative test like this,

¹ *American Journal of Medical Sciences*, April, 1867.

so that while in the journal of the cases I have notes of all of the conduction experiments, I hesitate to produce them here, or to found upon them any absolute conclusions as to the location of the lesion causing the deafness. For the same reason, and to simplify these statistics, I represent the membrane as either normal or abnormal; the occurrence, say, of a perforation in one, places that case among the abnormal, although the other membrane be intact. "Membrane normal," therefore, means that there is no marked pathological appearance on either side.

TABLE II.

	Acquired Deafness.	Congenital Deafness.	Doubtful.	Total.
Membranes normal.....	28	26	7	61
Suppurative otitis media, active or extinct.....	18	11	3	32
Changes indicating non-suppurative catarrh.....	34	33	11	78
Unexamined	1	—	1	2
Meatus too narrow for examination.	—	2	—	2
	81	72	22	175

TABLE III.

	Meningitis and Brain Affections.	Falls and Head Injuries.	Measles.	Scarlet Fever.	Ear Affections Proper.
Membranes normal....	10	5	4	1	—
Suppurative lesions....	2	1	4	1	4
Non-suppurative lesions	7	5	2	1	4
Unexamined.....	1	—	—	—	—
	20	11	10	3	8

NOTE.—This table should be read in connection with the remarks made upon the various causes of acquired deafness in the earlier part of this paper.

When we compare the appearances (Table II.) in acquired and congenital deafness, the contrast is less striking than

we expect. There are almost as many normal membranes in acquired as in congenital deafness. There is greater destruction of the membrane from suppurative disease amongst the acquired cases, but even here the contrast is not a strong one. In-drawing and other non-suppurative changes are commoner to a slight extent in the congenital cases, but there is an absence of characteristic lesions in parts which can be seen through the speculum.

There was no case of malformation of the auricle in the entire list of 175 cases. Two cases of extreme narrowness of the external auditory canal were found; both were cases of congenital deafness. In one, other deformities existed: these consisted of cleft palate¹ with posterior curvature of the spine and very deficient eyesight; the mouth and teeth were also markedly syphilitic. Another case of malformation, consisting of a very unusual arrangement of the fingers of one hand and the toes of one foot, with webbing between the digits, was found, but the boy had fairly wide auditory canals, through which were seen opaque, and somewhat lustreless but intact membranes. A well marked case of false membrane after suppurative disease was seen. Many of the lesions which disfigure the tympanic membranes of deaf-mutes occur subsequent to the onset of the deafness, and in this way much that is characteristic of the two classes of cases becomes obliterated. About seventy per cent. of the children showed distinct thickening of the tonsils, pharynx, or both. In about thirty-three per cent. the tonsils are described as being much thickened, or the pharynx as very distinctly altered in the direction of disease, but these latter cases are not associated with any special condition of the tympanic membrane.

Roosa and Beard's examinations tally almost exactly with my own estimates,—they found that fully two thirds of the deaf-mute children showed pharyngeal disease or enlargement of the tonsils. Has this anything to do with the production of the deafness? In most of the acquired cases I do not think it has. Most of these are fully accounted for by lesions which have set in with definite symptoms

¹ Compare Case 1 (Hyrtl), Hartmann's list. *Deaf-mutism*, p. 206.

leading up to the deafness. But over twenty per cent. of the acquired cases (19 in 81) have no cause assigned to them. The terms used in answer to the question are, "uncertain," "unknown," or "doubtful," or the information is simply withheld. Now it is noteworthy that in at least half a dozen of these cases, although the cause is stated to be "unknown," the date of the onset of the deafness is definitely stated, *e. g.*, "unknown at four years," "at three years," etc. There is here an absence of sudden onset or of striking concomitant symptoms, and deafness occurring under these conditions is suggestive of the insidious invasion of non-suppurative catarrh. It is amongst these "unknown" causes I think, that this disease plays its role in acquired deafness. But these cases do not represent all the mischief done by the disease. It is a common affection amongst the young between three and ten years of age, and young deaf-mutes cannot be freer from it than their hearing brothers and sisters. If then in a child some damage has been done to the labyrinth by accident or disease, and he be in consequence on the border of mutism, and if the condition of the naso-pharynx be favorable to the development of non-suppurative catarrh of the middle ear, his hearing may soon be damaged by this catarrh to an extent quite incompatible with the retention of speech. It is just possible too that this affection may account for some of the cases of so called congenital deaf-mutism. Any disease without striking symptoms causing deafness during the first year of life, will give rise to the impression that the case is one of congenital deafness, and we have no reason to suppose that the first year of life is free from non-suppurative catarrh of the middle ear.

A study of the anatomical conditions upon which congenital deafness depends is not within the scope of this paper. No light can be thrown on them by examinations such as the present. The absence of malformations in the external parts does not warrant a similar conclusion with regard to the labyrinth. It will be recollected that the vestibule, the semicircular canals, and the cochlea are all developed from a primary otic vesicle, after the latter has be-

come a separate and closed sac, and that the tympanic cavity, the Eustachian tube, and external canal are the remains of the first post-oral cleft. Malformation or arrest of development may go on quite independently in these two regions, and if we are to judge from the reports of post-mortem examinations on congenital deaf-mutes, defective development is not uncommon within the auditory sac. The result of such arrest may be total absence of the labyrinth or deficiency in its component parts. The cochlea is sometimes reported to have a smaller number of turns than usual; one or more of the semicircular canals have been found wanting; or the fenestræ may be absent or ossified.

There is little more to add. Most of these cases of deafness are beyond the resources of our art before they are admitted to the Deaf and Dumb Institutions. I need not repeat the plea so often made for the early diagnosis and treatment of all diseases of the ear. Children frequently come to the Institution to be told for the first time that their deafness is incurable, and the parents quote opinions to the effect that their child's hearing would come right at seven or at fourteen years of age. Now this is such a common experience amongst teachers, that I have been asked by Mr. Addison, our Head Master, to mention the matter in this paper. Talk like this must be either founded on ignorance or be due to a delicacy about the statement of an unpalatable truth. But it is fraught with the greatest danger; it prevents the parents of deaf children from seeking advice at the right time, and it postpones in like manner the adoption of proper methods of education till the most valuable years of childhood have slipped away.

OSTEOMA OF THE MASTOID.

By J. ORNE GREEN, M.D.,

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CASE I.—P. H. K., aged sixteen years, a strong, healthy boy, had known he was somewhat deaf in one ear for several years, but had thought nothing of it. Both he and his parents asserted positively that he had never suffered from ear-aches or otorrhœa. Three weeks before I saw him on November 18, 1890, he began to have redness, swelling, and pain just below the ear, and, on examination, a very superficial abscess was found between the mastoid and the jaw: this was opened and evacuated. The meatus was completely filled with a smooth, hard growth rising from the posterior wall, and the exploring needle proving this to be osseous, a diagnosis of exostosis was made.

Three days after there was increase of pain and discharge from the meatus, apparently forced out from behind the growth; the abscess-cavity having healed. In another three days the tissues over the mastoid became red, swollen, and œdematous, and the bone was sensitive on pressure. I thought I detected slight movement of the mass in the meatus in manipulating it.

With a closed meatus and increasing pain and discharge an operation was imperative, and under ether the auricle was turned forwards, exposing the anterior part of the mastoid, when immediately a movable, hard mass on the anterior surface of the mastoid was exposed and readily enucleated with a director. Its removal cleared and exposed the meatus, for it had constituted the whole posterior wall of that passage.

The growth lay imbedded in the mastoid and was surrounded by caseous material, epidermal flakes, and a small amount of pus, and the osseous walls of the cavity were carious superficially. All foreign matter and softened bone were removed, the cavity

and meatus, which had become one, were cleansed with corrosive sublimate solution, 1-3000, and an antiseptic dressing applied. The drum-membrane was enormously swollen, but not perforated.

Daily antiseptic cleansing was used, and at the end of a week, all odor having disappeared and the discharge having greatly diminished, the auricle was stitched into position and in a few days was firmly adherent. The daily cleansing was continued through the meatus and by December 20th the discharge had ceased, the cavity and the meatus were covered by a normal epidermis, the landmarks of the drum-membrane had reappeared, and the hearing was nearly perfect.

Six months after the ear was normal in appearance and formation, except for the cavity in the posterior wall of the meatus which was covered with a firm skin.

The tumor was of an irregular oblong shape, 19 *mm* long, 15 *mm* wide, and 9 *mm* thick; it was composed, as Dr. W. F. Whitney reported, of true bone in its interior, showing well developed bone-corpuscles, and the outside was entirely covered with a layer of cartilage which had ulcerated in two spots where the underlying bone was carious superficially.

CASE 2.—J. W., aged twenty-one years, a healthy man, was seen on October 31, 1892. He had been deaf in the right ear for several years, but had never suffered from pain or discharge till ten weeks ago, when the ear began to discharge without known cause, and for the last week he had had much pain in the ear and over the right side of the head. Examination showed the right meatus completely closed by a hard, bony tumor, which was slightly movable. There was a slight amount of purulent discharge from the deeper ear passage, but no increase in temperature or general symptoms. The tumor was covered with normal skin, and there was no swelling or tenderness of the mastoid.

On November 1st, under ether, the auricle was displaced forwards, and the tumor was immediately exposed lying in the mastoid and constituting the posterior wall of the osseous meatus. It was freely movable and easily taken out with forceps, like any foreign body, leaving a large cavity in the bone, which contained detritus and the walls of which were carious superficially. After thoroughly cleansing with corrosive sublimate solution, 1-3000, the auricle was stitched into place, a cotton tampon inserted in the meatus, and a baked gauze dressing applied.

On November 5th the stitches were removed, and the meatus, in which some granulations were seen, was thereafter dressed daily. On November 12th, the wound had firmly united by first intention throughout, the granulations of the meatus had disappeared, but there was a small amount of purulent discharge from that passage. On November 21st, all discharge had ceased, the drum-membrane was without perforation, but still much swollen, and the landmarks were not yet visible. The hearing was rapidly improving. W. r., $\frac{50}{100}$; V. r., $\frac{15}{25}$; and there were no subjective noises.

Dr. Whitney reported of the tumor that it was an oblong rounded growth, 12 mm long and 11 mm thick, with a fibrous-looking surface. The centre was occupied by a hard bony mass. Microscopic examination showed the outer layers to be made up of a fibrous tissue, while the centre was true bone with regular, well-formed bone corpuscles. On two small spots it showed superficial caries.

The ordinary bony growths of the meatus are of two varieties, the exostosis arising from the very deepest meatus, usually close to the membrana tympani, showing more or less attempt at pedunculation, but firmly attached to the underlying bone; and the hyperostosis, an extensive enlargement of the bone over a considerable extent of its surface, broad-based, without any attempt at pedunculation, and arising from the walls of the osseous meatus, in most cases farther outwards than the exostoses. Our two cases presented tumors entirely different from these common forms however. The tumors lay just within the orifice of the meatus, and evidently arose from its posterior wall. On superficial examination they appeared firmly attached, but by careful pressure a very slight movement was perceptible. Their distinctive character, however, was perfectly evident after removal; both were growths of true bone, oblong, and covered throughout, except at two minute spots, each the size of a large pin's head, with tissue, one with cartilage and the other with fibrous tissue. Both were situated in the anterior and outer part of the mastoid, but not attached to that bone, and both were lying in carious cavities.

The history of both cases was exactly alike. No account

of ear-aches or otorrhœa months or years before, but merely the story of deafness of several years' standing, coming on without any symptoms, then for a few weeks gradually increasing pain, discharge, and swelling about the ear, which led the patients to seek advice. In neither case was the drum-membrane perforated, although it was enormously swollen.

The cause of the final inflammation is not clear. There was no history of a sudden attack of earache which might have set up a suppuration behind the growth, and so have led to the carious condition, but rather one of a slowly increasing inflammation, as if the tumor either had outgrown its supply of nutrition and was being thrown off by a natural process, or else by its increasing size had interfered with the circulation of the meatus and thus caused the suppuration.

No signs of any attachments of the tumors to the bone could be made out, unless we regard the small spots of caries as the original seats of such attachments. The fact that these carious spots were in two different places on each tumor is decidedly against this theory, however, and the existence of the caries is readily explained by the suppuration which was occurring around them. Both occurred in males of early adult life. On the whole, it seems probable that we were dealing here with true neoplasms of slow, non-inflammatory growths, and possibly of foetal origin, and from their structure the name *osteoma* seems most appropriate.

A SERIES OF CASES OF NEW GROWTHS OF THE EAR.

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THE accompanying cases seem worthy of being recorded as offering unusual varieties of aural disease.

EPITHELIOMA OF THE AURICLE; AMPUTATION; RECOVERY.

J. S., aged about sixty years, was seen on October 26, 1891, giving a history of a growth on the anterior of the antihelix beginning two years before without known cause as a small wart. It had gradually enlarged and ulcerated, and for the last four months he had suffered much shooting pain in both the ear and side of the head. Examination showed a superficial ulceration confined to the anterior surface of the auricle, about seven-eighths of an inch in diameter, with everted and indurated edges. It was firmly attached to the cartilage, but apparently had not extended into that tissue. It was not sensitive, and there was no involvement of the glands in the neighborhood.

The appearance, duration, and increase in the growth leaving little doubt of the diagnosis, amputation of the whole auricle was advised, and the next day it was done under ether, the entire auricle with the cartilage down to about the middle of the cartilaginous meatus being removed by dissection. A portion of the lobule was retained as was also the tragus. Care was taken to dissect off the skin at the orifice of the meatus and to leave enough skin from the posterior of the auricle to close the wound completely. Antiseptic precautions were used, and a dry sublimate gauze dressing applied.

On October 31st the dressing was removed and it was found that the wound had healed by first intention throughout and the cat-gut sutures had almost disappeared by absorption. A collodion dressing was applied for four days more and the patient then discharged well. Dr. W. F. Whitney, on examination microscopically, reported the growth as epithelioma.

In May, 1892, there was no sign of the return of the growth, the patient remaining perfectly well and the hearing being good.

The radical operation of amputation seemed advisable from the firm adhesion of the growth to the cartilage and its great extent. The lobule and tragus were retained as supports for an artificial auricle to be worn later. The retention of the skin of the meatus and for a short distance into the concha is very desirable to prevent the closure of the meatus by granulation tissue, which it is very difficult, if not impossible, to prevent where a granulating wound is left, and which I have seen occur in a similar case in spite of every effort to prevent the closure.

EPITHELIOMA OF THE MEATUS; REMOVAL OF THE
CARTILAGINOUS MEATUS; RECURRENCE; DEATH.

Mrs. C. S. H., aged eighty years, appeared at the Massachusetts Charitable Eye and Ear Infirmary, September 8, 1891, with a history of otorrhœa on the left side of two years' duration, and of a recent sense of fulness of the ear with pain in the upper parietal region. The meatus was completely filled with a firm growth of broad base springing from the superior and anterior walls of the cartilaginous canal. Under ether this was removed with the snare and curette by one of my colleagues, with relief to the pain and fulness, and Dr. Whitney reported that the specimen consisted of fibrous tissue and round cells, giving the appearance of a fibroma.

By October 1st, in spite of appropriate treatment, the growth had recurred so as to fill the canal, and the pain and fulness had returned. On October 30th, the meatus was tightly closed and the growth began to be nodulated on its external surface and there was dull aching in the ear, and sharp lancinating pains to the temple and lower jaw. There were no glandular enlargements.

On November 3d, under ether, the auricle and cartilaginous meatus was dissected from behind and turned forwards, the cartilaginous separated from the osseous meatus, and the whole cartilaginous meatus removed with the new growth attached—the cartilage externally being cut off just at the orifice of the meatus. After removing the cartilage the deeper meatus was found to be filled with a separate growth, soft and smooth, which was removed with the snare, leaving the meatus clear, with its osseous walls denuded, but apparently not carious. The drum-membrane showed signs of old disease, being thickened and adherent to the promontory. The attachment of the second growth could not be made out as it came out so absolutely clean as to leave no signs of its origin. From the results of the microscopic examination it was probably a granulation growth from the osseous meatus. The auricle was then replaced and stitched by cat-gut sutures and the meatus tamponed with sublimate gauze, after thorough cleansing with corrosive sublimate solution, 1-3000. A dry sublimate dressing was applied to the auricle. The meatus was cleansed twice daily with corrosive sublimate solution, 1-3000, and kept tamponed with a cotton pledget soaked in carbolic oil.

On November 8th, the wound behind the auricle had apparently healed, except three small stitch-abscesses, but two days after broke open, and finally healed slowly by granulation. On November 18th, all suppuration had ceased, and by the 25th, the auricle was firmly united and the meatus was covered with a healthy skin, except at the lower anterior portion. Two weeks later this spot had healed and all discharge from the meatus had ceased.

Dr. Whitney reported the growth from the cartilage an epithelioma, that from the deeper meatus a round-cell polypus of the ordinary variety.

The patient remained well for only a few weeks when there was recurrence of the growth apparently from the anterior wall of the meatus, which was removed by Dr. Blake in the same way as at first by displacing the auricle forwards, but the growth recurred almost immediately, and the whole auricle and tragus were then removed by him and the wound healed well.

In September, 1892, there had been a recurrence of the growth in the meatus which was nearly as large as the first, and within a few weeks the glands in the neighborhood became infiltrated, but there was no marked pain. The patient had become gradually

weaker, when one day the growth was found to be much less prominent than usual, "to have settled into the head," and simultaneously with this a complete hemiplegia of the right side occurred, followed by death on the next day. No autopsy and no exact history of the final symptoms could be obtained.

PRIMARY SARCOMA OF THE MEATUS; REMOVAL;
RECOVERY.

J. S., a stout healthy girl, aged seventeen, during a cold in the head, had pain in the right ear followed by discharge, the beginning of which she could not define accurately. The pain ceased when the discharge began. After some three weeks of discharge unattended by pain or other symptoms, she began to have severe pain at night in the deeper meatus, and after five days of this was seen by me on October 25, 1889.

There was a moderate amount of semi-purulent discharge in the meatus, and a round fleshy tumor somewhat larger than a pea on the anterior wall of the right cartilaginous meatus. The tissue surrounding this tumor was so greatly infiltrated and bled so freely on touching it with a probe that I suspected it immediately and, after removal by the snare, sent the growth to Dr. W. F. Whitney, who reported it "to be composed of small round and spindle cells with a slight granular interstitial tissue. The blood-vessels seem mere channels rather than true vessels. Microscopically the growth has the structure of a sarcoma."

The tumor itself was wholly removed by the snare with very free bleeding, and its base was cauterized with argentic nitrate, but instead of healing as ordinary inflammatory growths do when arising from the walls of the meatus, the surrounding tissue became more oedematous and swollen, and there was an immediate recurrence of the growth, which on November 8th, had reached nearly its former size. It grew from a broad base, and the surrounding tissue nearly to the drum-membrane was infiltrated and apparently fluctuating. Not only the projecting tumor itself, but all of the swollen tissue bled freely on touching, and a probe could be passed into it without force to the depth of half an inch without evacuating any fluid or touching any bare bone.

It was treated simply by warm douching with morphine internally for the pain, but continued to enlarge without showing any

attempt. at pedunculation and the surrounding tissue was extremely friable. There were no enlarged glands anywhere and no family history of malignant growths.

On December 1st, under ether, a drop of a 4 % solution of cocaine was injected subcutaneously in four different spots and then with a curette all the affected tissue was removed, laying bare the cartilage and bone. No sinus in either of these tissues could be discovered. The effect of the cocaine was so successful in checking the hemorrhage that there was no obstruction of the view, and not more than one drop of blood was seen. The meatus was dressed with a pledget of cotton soaked in carbolic oil, 1-10, and over this was a dressing of sublimate cotton. Sublimate irrigation, solution 1-3000, was used every second day, and the former dressing renewed.

The pain was entirely relieved within two days and never recurred. The skin gradually formed over the exposed surface without any suppuration or exuberant granulations, and on December 23d the ear was well. One month after the ear was absolutely perfect in appearance and the hearing was normal.

Dr. Whitney again examined the growth removed at the second operation and reported as follows: "It is composed of round cells with a very fine homogeneous intercellular substance; among these round cells are imbedded large multilocular cells (giant-cells), and the growth is traversed by numerous relatively large blood-vessels. The diagnosis is sarcoma of the giant-cell variety of the teleangiectatic form."

The patient remained well in May, 1892.

Primary sarcoma of the meatus must be a very rare disease. I myself have never met with a case before, and the only references to the disease which I can find in the literature of the ear are a case of osteo-sarcoma of the meatus described by Buck¹ and a case of sarcoma of the meatus by Sheild.²

The characteristics in this case which immediately aroused my suspicions were the infiltration of the surrounding tissue, the bleeding on touching, and the friability of all the affected tissue, which was evident at the first examination

¹ *A Manual of Diseases of the Ear*, p. 118.

² *Archives of Otology*, January, 1892.

and which increased as the disease progressed ; a probe could be readily thrust into its substance at any point without violence.

The operation offered nothing worthy of note except the use of the cocaine which exceeded my expectations in wholly checking hemorrhage from an extremely vascular growth, thereby enabling me to see perfectly throughout the whole operation. The rapid healing without suppuration shows the value of the antiseptic dressing.

CAVERNOUS ANGIOMA OF THE AURICLE ; LIGATION OF THE
EXTERNAL CAROTID ; REMOVAL ; RECOVERY.

G. E., aged twenty-five, a robust, healthy man, was born with an angioma on the upper part of the right auricle. This gradually enlarged as he grew up, and for a year before he was seen at the Massachusetts Eye and Ear Infirmary in November, 1889, it had been ulcerated on its anterior surface and he acknowledged violent hemorrhages from the ulceration, the last one about one week before entrance. All were checked by a compress over the surface. The only symptom complained of at entrance was a violent throbbing on that side.

The whole auricle was a mass of tortuous blood-vessels, some as large as a lead-pencil, and the same mass of vessels extended back over the mastoid for about an inch. The vessels were bluish in color, but evidently communicated freely with arteries, for nearly the whole mass was pulsating violently. On the anterior surface was a thick crust, and beneath it evidently quite a large cavity. Pressure over the carotid artery checked the pulsation almost entirely and much reduced the tension of the tissues. There was no involvement of the occipital artery. The auricle measured fully four inches from its upper to its lower edge (*vide* illustration).

November 27th, under ether, Dr. S. J. Mixter, Consulting Surgeon of the Infirmary, ligated the external carotid artery just above a small artery passing towards the median line, which was probably either the thyroid or the lingual. All pulsation in tumor and occipital artery ceased immediately, and the auricle diminished very perceptibly in size and lost its tension ; but large masses of vessels remained behind, above and below the

auricle. The crust over the antihelix was removed with forceps and about half a minute afterwards very profuse venous hemorrhage occurred from about the centre of the spot previously covered with the crust. This could only be controlled by pressure just below the bleeding spot, and as it was impossible to determine the course of the vessel from which the hemorrhage came, a stitch was passed directly through the auricle from behind, over the vessel and back again through the cartilage,

tied, and the vessel, thus enclosed in the loop, controlled completely. The whole surface of the antihelix over which there had been a crust was in a state of superficial ulceration with a slight amount of pus and with hypertrophied papillæ. After thorough cleansing with sublimate solution an antiseptic dressing was applied so as to exert slight pressure over the whole auricle.

November 28th.—Restless night, with much complaint of soreness in the neck, but otherwise doing well.

December 2d.—Since the operation patient has been doing well,

except for an attack two days ago of acute rheumatism in feet and knees, relieved by salicylate of soda. Last night a sudden discharge from just below the auricle of an apparently sero-purulent fluid, odorless, probably amounting to half an ounce. This morning the tension of the auricle is much less than two days ago. No pulsation anywhere. The enlarged veins above, behind, and below the auricle are very much diminished from two days ago. No discharge from opening of last night. Ulceration over antihelix about the same. Dressed with iodoform.

December 4th.—Wound unsealed yesterday; found to be suppurating slightly through a small opening; no induration of the neck.

December 7th.—Wound still discharging; no inflammation of surrounding tissues. Within two days the least little pulsation is to be felt at insertion of auricle behind. No pain. The patient confesses to many previous hemorrhages, one amounting to one pint.

December 11th.—On removing dressing this morning a violent venous hemorrhage occurred from the same spot as on first operation, the stitch having ulcerated through the cartilage; it was checked by a compress and bandage. Amputation advised on consultation with Drs. Mixter and Morse. Patient etherized and angioma removed by Dr. Mixter by slow dissection, lasting two hours and a quarter. Every bit of the angiomatous tissue was apparently removed. Four or five nutrient blood-vessels entered the mass from the deeper tissues. The skin at the orifice of the meatus was saved, but the cartilage down to within the orifice of the meatus was removed. A large amount of blood was lost, but not more than would be expected from the character of the disease. After all the angiomatous tissue had been removed an incision parallel to the first cut and two inches behind it was made through the scalp, the scalp dissected up, and this piece slid forward and stitched over the exposed wound. Many vessels were tied, some with cat-gut, some with silk, and all cut short. Operation was done with antiseptic precautions and dressed antiseptically. The patient bore the operation well.

December 16th.—Has been doing perfectly well. There is scarcely any pain and the wound looks nice.

December 23d.—A large number of grafts of epidermis were applied to granulated surfaces of posterior wound.

December 28th.—A large number of grafts have taken finely. The wound is looking well.

January 1st, 1890.—The patient discharged nearly well.

The final hearing was delayed some weeks by a heavy silk ligature on the largest of the ligated arteries, but when this came away the wound closed perfectly, and no trace of angiomatous tissue could be discovered anywhere. The deeper meatus had never been invaded by the growth and the hearing was perfect.

The patient was seen several months afterwards. There was no sign of any recurrence, and he was wearing an artificial auricle with satisfaction to himself.

ANGIOMA OF THE TYMPANUM.

T. McK., aged forty. Father died at sixty-six years of age. Mother and six (all) brothers and sisters living and well. Never sick until four years ago, then he had two hemorrhages from the mouth and was in the Massachusetts General Hospital for ten days. Told that he had bronchitis. Three winters ago he had the "Grippe." The following spring the left ear began to feel full, the hearing to fail, and he had noises. A little later the ear commenced to pain him, at first only slightly. His hearing and the pain continued to get worse and worse through the summer, and the noises like the ringing of bells increased, and in October he came to the Infirmary. Paracentesis was done, but no discharge from the ear followed. Pain was somewhat relieved, but the noises and fulness continued. About a month later paracentesis was again done and a little later a polypus removed. Last May paracentesis was again done, after which there was a tremendous hemorrhage. The ear was packed and he remained lying down in the hospital two hours before the bleeding was stopped. He was sent home and told to stay in bed for two days. There was no more hemorrhage. Since then paracentesis has been done twice, the last time two months ago, after which there was only slight hemorrhage. Pain continues, but is less. At times it is so severe as to keep him awake, and at times extends down the neck and over the mastoid. Hearing remains unchanged. At times he feels dizzy. Noises like little bells are constant.

Tests. W. r. $\frac{3}{8}$; l. $\frac{c}{80} = 0$. V. r. $\frac{1}{2}$; l. $\frac{2}{8}$.

Rinne F. C. $\frac{2}{6}$ r. $\frac{3}{12}$; l. $\frac{2}{18}$. Weber F. C. r. > 1 .

Patient is fairly developed and nourished. The left meatus is of fair size and moderately straight and without signs of congestion. The situation of the drum-membrane is occupied by a membrane of good polish and irregular surface all of which, except the anterior and upper quadrant, projects slightly and is of a reddish color, deeper in some spots than in others. No landmarks are visible. By the small light reflexes on its surface, the whole surface can be seen to beat synchronous with the radial pulse. The whole projecting mass is very soft and readily compressible with the probe. Deep pressure on the common carotid reduces the pulsation, but does not check it entirely. By Valsalva air enters freely with slight movements, but without change in the appearance. The highest-pitched fork is just heard by A. C. All other forks not heard by A. C. Galton, lower not heard, high heard, and very high quite well heard.

December 12th.—Ear plugged with absorbent cotton to-day and firm pressure applied to the pulsating mass.

December 17th.—Pressure continued. Pulsation seems less marked and is not heard so distinctly by the patient.

December 24th.—Deep firm pressure with cotton tampons continued daily for six hours. No pulsation visible. The character of the mass has changed from an irregular surface with deep red spots to a smoother surface of a pinkish color, and has lost its venous look. No throbbing felt.

December 31st.—Pressure has been continued daily. Mass is not changed in appearance, except to be paler and more grey. No throbbing felt or heard, and no pulsation visible. Hearing is the same as on entrance.

The absence of all pulsation, objectively and subjectively, continued for about two months, when there was a return of the subjective throbbing in a slight degree, unaccompanied by any of the old symptoms of pain, bells, or vertigo. There had been no change in the hearing. After that time I did not see the patient till November, 1892. There was only slight pulsation felt and that only occasionally. There was no pain and the hearing was the same. All landmarks on the drum-membrane were obliterated, but the membrane itself was somewhat nodulated, of a pinkish color, and somewhat yielding to the probe. No pulsation could be perceived.

The appearance of the drum-membrane in this case when I first saw it gave the impression on a superficial examination of a

membrane bulging from a collection of bloody serum in the tympanum, but a more careful inspection showed that the membrane, manubrium, and short process were all involved in some form of tumor which filled the tympanum, and the distinct pulsation of the whole surface proved, I think, that it was composed largely of blood-vessels. The history of the previous hemorrhages following paracentesis confirmed this.

I determined to try the effects of pressure by cotton tampons, and applying them at first for only six hours a day was soon enabled to keep them in for twelve hours without irritation. Under this treatment, within ten days the pulsation had ceased both objectively and subjectively, to the very great comfort of the patient. At no time was there any complaint of pain or vertigo from the applications. The absence of all pulsation for about two months showed a measurable degree of success, and I cannot but think that a further course of the same treatment, if the patient had been willing to follow it, might have obliterated the circulation and produced a cure.

I have called the tumor an angioma, as this seems to me to be the probable diagnosis, for the extent of the growth, its irregular surface, and venous appearance, speak rather for that than for an aneurism.

ANGIOMA OF TRAGUS.

A. E. P., aged forty-one, has been perfectly well until an attack of typhoid fever in 1888-89. Following the typhoid fever she began to have discharge of blood from the ear, at first drop by drop and only once in two or three months, later increasing to once every week or ten days, and soaking from five to thirty handkerchiefs. She has no pain in the ear, but a continual throbbing, and occasionally an attack of very severe headache. The attacks have no connection with menstruation.

Examination: General condition is excellent. On the inner side of the tragus there is a small discolored patch covered with a small crust of dried blood. There is marked swelling of the upper anterior wall of the cartilaginous canal, so that the membrana tympani is seen with difficulty. Membrana tympani is normal. The hearing is good.

October 28th.—Under ether, the angiomatous tissue is found to be superficial and well defined and of smaller extent than supposed. It was removed by dissection with very little bleeding and the

wound brought together with cat-gut sutures. A dry dressing applied.

November 3d.—Stitches removed. Good union by first intention.

November 5th.—Wound firmly healed. No throbbing or bleeding since operation.

Since that time I have heard nothing from the patient.

TWO CYSTOID POLYPI OF THE MIDDLE TURBINATED BONE.

By W. FREUDENTHAL, M.D., NEW YORK.

(*With four drawings in the text.*)

WHILE a good many cystic polypi have been operated and their clinical features described by various authors, the result of microscopical examinations of these tumors has been but seldom published. One reason for this may be that many operators are made aware of the nature of such growths only through the copious discharge of serum, which suddenly gushes forth at the moment of removal, as exemplified by the cases of Lefferts¹ and Seiler.² A great confusion reigns regarding not only the nomenclature but also the development of these cysts.

To mention a few of the many workers in this field, Lennox Browne³ thinks that "cystic degeneration is also sometimes said to be due to liquefaction of the myxomatous tissue," and on this point, as will be seen later on, he comes very near to my views. Lalit⁴ describes a myxomatous polypus filled with colloid substance. A thick layer of connective tissue surrounded the cavity. The dissertation of Haken is known to me only through the report in the *Internat. Centralblatt für Laryngologie*. He expresses similar views to those which will follow.

¹ *Med. News*, Philadelphia, Dec. 15, 1883, vol. xiv., p. 653.

² *Med. Times*, 1884, p. 351.

³ *The Throat and Nose*, Philadelphia, 1890, p. 601.

⁴ "Sur un Cas de Polype Cystique des Fosses Nasales," *Annales de la Polyclinique de Bordeaux*, Jan., 1890.

I also had made close microscopical examinations of two cases coming under my care, which I will now cite.

CASE I.—Minnie R., a native of Russia, sixteen years old, came to the German Poliklinik complaining of severe headache and pains over the right eye, accompanied by obstruction of the right nostril. The last symptom was noticed within six months. On examination I found a tumor of the size of a split bean, attached to the mucosa of the middle turbinated bone of the right nostril by a pedicle somewhat narrower than the main tumor. Its surface was slightly hilly; its consistency a trifle harder than that of ordinary polypoid tumors; its color a grayish white-blue. I declared it to be a simple myxomatous polypus and operated it at once in the presence of some gentlemen of the Postgraduate Medical School. But at the moment of removal with a cold snare a considerable amount of a colorless viscid liquid was discharged, and the formerly voluminous mass shrank to a very small amount of tissue, which remained in my snare. This led me to the correct diagnosis.

Sections were made vertically through the long axis of the tumor. Under the microscope we see the free surface of the growth covered by a single layer of columnar epithelium. The main mass consists of a myxomatous tissue, densest along the periphery close beneath the epithelium and becoming looser towards the centre. At that point the meshes of the myxomatous network are of a considerable width, partly empty, partly filled with a faintly granular liquid. The vascular supply consisting of arterioles, capillaries and small veins, is scanty throughout the tumor and comparatively more abundant only in that portion which had served for an attachment to the mucosa. This pedicle is made up of a rather dense myxo-fibrous tissue, surpassing in density even that in the cortical portion of the tumor. Possibly the pressure of the snare has contributed to this condition (see Fig. 1).

The central portion of the tumor is taken up by an empty cavity running lengthwise through its longitudinal diameter. This cavity is nowhere bordered by a membrane or capsule of its own; but all over its periphery it appears to be surrounded by the myxomatous tissue building up the main mass of the tumor with considerably widened meshes.

With a power of 500 diameters the features prove to be as fol-

lows (see Fig. 2). The columnar epithelia are of varying sizes, according to the hilly elevations on the surface and the valleys between them, and indistinctly nucleated. The narrowest columnar epithelia are seen in the valleys, the broadest on the tops of the hills. Between the fully developed epithelia we notice everywhere conical wedges, and all these formations are separated from one another by a distinct light layer of cement substance. The border line between the epithelia and the subjacent connec-

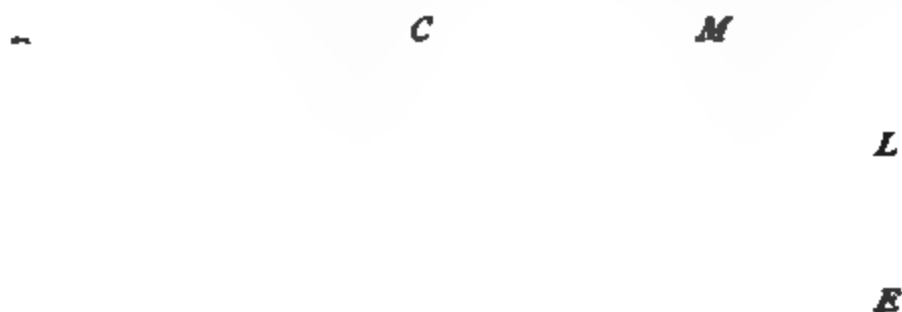


FIG. 1.

Myxoma in Cystic Degeneration. $\times 50$.

- E.* Covering columnar epithelium.
- L.* Cortex of tumor made up of lymph or adenoid tissue.
- M.* Myxomatous tissue of the type of that of the umbilical cord.
- F.* Delicate fibrous connective tissue at the root of the tumor, richer in blood-vessels than the rest of the tumor.
- C.* Cyst, result of liquefaction of the myxomatous tissue.

tive tissue is, in many places, sharply defined, in others, on the contrary, but little pronounced, so much so that in the latter situations it is almost impossible to exactly define the line where epithelium ends and connective tissue begins. The tissue beneath the epithelium consists of a dense myxomatous reticulum with a scanty supply of protoplasmic bodies in the meshes. The pedicle shows an extremely dense network of a myxo-fibrous tissue, apparently lacking protoplasmic bodies. In some places, however, the cortex of the tumor is abundantly supplied with lymph-corpuscles to such an extent that a regular lymph or adenoid tissue is produced, which invariably remains confined to the cortical portion (see Fig 2).

The central portion resembles somewhat the structure of the umbilical cord. It is made up of large branching tracts of protoplasm or fibrous connective tissue. A number of these tracts contain capillary blood-vessels, either compressed and exhibiting an extremely narrow calibre, or solidified by a proliferation of the endothelial wall, whereby the vessel is obliterated (*O*). The meshes hold a finely granular myxomatous basis substance and a varying number of non-nucleated protoplasmic bodies, nowhere on an average in excess of the size of lymph-corpuscles. Many meshes appear to be considerably widened and filled with a uniformly granular mass of coagulated albumin, closely resembling the liquid of œdema after preservation in chromic acid solution. Both the trabeculæ and the granular masses filling the meshes border the central empty cavity in a rather irregularly wavy line.

The scanty blood-vessels traversing the tumor, especially the capillaries, are conspicuous by a broad adventitial coat of a delicate fibrous connective tissue blending with the myxomatous tissue. The veins appear engorged with red and colorless blood-corpuscles, obviously in consequence of the application of the snare around the pedicle.

CASE 2.—H. S., a tailor, twenty-one years old, born also in Russia. He visited the clinic on October 8, 1892, with complaints of obstruction of the left nostril. On examination I found a tumor pendent from the middle turbinated body. It was of the bulk of a middle-sized bean and of a soft consistence. Its surface was but slightly hilly, in most places even. Its color of a grayish-red, deeper than in the previous case. I removed it in the same manner as in the previous case and with like result.

Sections made vertically to the longitudinal diameter of the tumor exhibited a covering layer of columnar epithelium over its main periphery. This layer is changed into stratified epithelium, in the lower portions only with hornified epidermal scales.

The main mass of the tumor is composed of the myxomatous variety of the connective tissue, densest toward the points of attachment to the mucosa. A cortex as in the previous case is

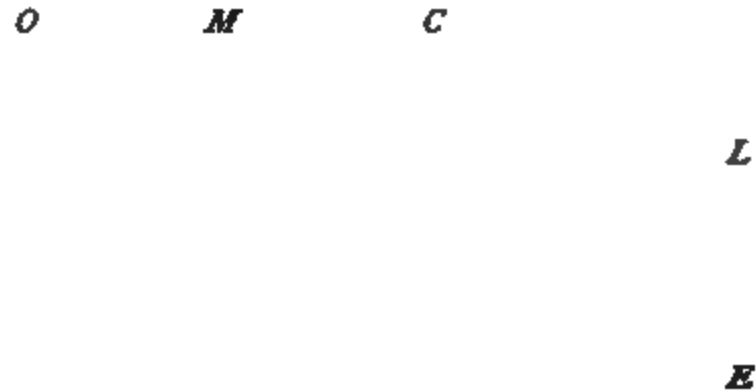


FIG. 2.

Myxoma in Cystic Degeneration. $\times 500$.

- E.* Covering columnar epithelium.
- L.* Cortex of tumor, made up of lymph or adenoid tissue.
- M.* Myxomatous tissue in beginning liquefaction of basis-substance.
- C.* Capillary blood-vessel, in transverse section.
- O.* Obliterated capillary blood-vessel.

nowhere conspicuous. The vascular supply, consisting of arterioles, veins, and capillaries, is only moderate. The veins are mostly wide and engorged with blood. Extravasated blood is seen at the points of previous attachment, owing, evidently, to the mechanical injury done by the snare. Here and there we

F *O* *M* *C* *E*

D

FIG. 3.

Myxoma in Cystic Degeneration. $\times 50$.

- E.* Covering stratified columnar epithelium.
- C.* Cystic cavity.
- M.* Myxomatous tissue with transitions to cysts.
- O.* Edematous myxomatous tissue.
- F.* Fibrous connective tissue at the root of the tumor.
- D.* Duct of mucous gland in transverse section.

meet with transverse sections of ducts of mucous glands, but the mucous glands are absent everywhere (see Fig. 3).

An empty cavity was seen at the upper periphery of the tumor occupying about a third of the diameter of the tumor. This cavity was not bordered by a wall of its own, but likewise, as in the previous case, by myxomatous tissue. A number of smaller cavities occurred near the root of the tumor, furnishing the transverse section with the appearance of a sieve.

With a power of 500 diameters the columnar epithelium appears to be of the variety termed stratified, inasmuch as not only numerous wedges are seen between the feet of the epithelia, but several nuclei are visible in the bodies of the epithelia. Further downward the epithelial cover is distinctly stratified, consisting of a single layer of columnar epithelia, two or three layers of cuboidal, and a thin layer of flat, horny epithelia. The border line between the epithelium and connective tissue is nearly everywhere sharply defined, almost of the refraction of a so-called basement-membrane. The myxomatous reticulum is densest around the periphery, and especially dense, almost of the type of fibrous connective tissue, at the points of previous insertion to the mucosa. Here and there heaps of lymph-corpuscles are seen at the periphery, but nowhere very broad.

The myxomatous tissue of the main mass is of the type of the umbilical cord, *i. e.* composed of trabeculæ made up of delicate fibres containing numerous protoplasmic bodies, and a few obliterated capillary blood-vessels. The enclosed meshes are filled with a finely granular, partly fibrous basis-substance, with a varying number of protoplasmic bodies, the size of lymph corpuscles. Towards the empty cavity above described, the trabeculæ appear to be stretched, their meshes considerably widened, the basis substance in many instances absent. Similar features are seen at the place mentioned to be of a sieve-like appearance. The blood-vessels, especially the capillaries, are supplied with a narrow adventitial fibrous coat in connection with the myxomatous reticulum (see Fig. 4).

Both specimens immediately after extirpation had been placed in diluted alcohol, and after some time in a solution of chromic acid of the strength of half of one per cent. The second specimen was difficult to harden, and a repeated renewal of the chromic acid solution was required for this purpose. The specimens were imbedded in celloidin, sliced with the section cutter,

and the slices stained with a solution of ammoniacal carmine, and imbedded in glycerine.

Cysts in polypous tumors of the nasal cavity were mostly known to be the outcome of the widening of the newly formed mucous glands. We know that most of the so-

L

M

E

FIG. 4.

Myxoma in Cystic Degeneration. $\times 500$.

E. Stratified epithelium.

M. Myxomatous tissue with wide meshes; beginning liquefaction of basisubstance.

C. Capillary blood-vessel in transverse section.

called polypi of the nasal mucosa are combinations of newly formed myxomatous connective tissue with newly formed acinous mucous glands; hence the scientific title of such tumors since Billroth and O. Weber, "myxo-adenoma." Should cystic cavities arise in such tumors, they invariably take origin from the glandular portion of the tumor and we can without exception trace the flattened epithelial lining of the cysts. In such an instance the scientific description of the tumor is "cysto-myxo-adenoma."

Quite different is the origin of closed cavities in my two cases. In both instances only myxomatous tissue has shared in the production of the tumors. In both glandular formations were absent. The proper designation of these growths is therefore "myxoma." The myxomatous tissue has in certain places undergone *liquefaction*. This process attacks first the basis-substance filling the meshes, next stretching of the trabeculæ takes place, together with obliteration of the capillary blood-vessels held therein. Ultimately liquefaction of the whole myxomatous tissue occurs, whereby a cavity is produced in the middle of the tumor, destitute of a wall of its own, but simply bordered by a partially liquefied or torn myxomatous tissue, exhibiting all transitional stages of liquefaction. Thus cavities filled with a viscid liquid are produced, which closely resemble the cavities so often seen in the substance of the umbilical cord.

Ordinarily cavities sprung from a liquefied basis-substance are termed cysts, the same as those originated in previous adenomas, viz., in epithelial structures. From a clinical standpoint this nomenclature may be justified; not, however, from the standpoint of the histologist. The latter will confine the name "cyst" only to formations lined by epithelia, developed from previous epithelia. Cavities, on the contrary, due to a partial liquefaction of myxomatous tissue, he will never admit to be genuine cysts, but only accumulations of liquid in spaces lacking walls of their own. Such cavities should be termed by a special name, as, for instance, "myxomatous cavities," and the tumor designated "HYDRO-MYXOMA" or "CYSTOID MYXOMA."

REMOVAL OF THE STAPES.

By CLARENCE J. BLAKE, M.D.

(Continued from page 202 of this volume.)

IN continuing the report of these operations it should be noted that the cases are given not chronologically, but with reference to their value as illustrating certain points touched upon in the text, the report of the cases in sequence being reserved for the conclusion of the paper in a later number of this journal and to be accompanied by a tabulation of the cases and their results. In two recent operations, to be reported later, the removal of the stapes was effected as in an earlier case reported in this number without division of the incudo-stapedial articulation and without tenotomy of the stapedius, traction being made upon the descending process of the incus so as to effect, first, the removal of the stapes from the niche, and, secondly, the separation of the malleo-incudal articulation, both bones in one instance being allowed to remain within the tympanum, and in two other cases, where the incudo-stapedial articulation was ruptured, the stapes being carried upward and backward by the pull of the stapedius muscle and the incus removed.

B. F. B., a young man, at that time nineteen years of age, was first seen in March, 1885; he was slight but well built and in good general health. The history of the case was that of a slowly progressive impairment of hearing of several years' duration and accompanied latterly by tinnitus aurium; the right ear had long been practically useless and the decrease of hearing in the left ear had led him to seek advice.

Both drum-heads were transparent, the Eustachian tubes were

free, and the mucous membrane of the nose and naso-pharynx was in good condition ; the hearing tests, however, both by aërial and by bone-conduction indicated interference with the sound transmission resulting from thickening and changes in the tympanic membrane especially in the neighborhood of the stapes ; the hearing for high tones was decreased in both ears, and the difficulty in hearing the voice was especially marked in reference to the soft consonant sounds and those of the harder consonant sound having slight qualitative differences. Under local treatment the hearing in the left ear markedly improved, only, however, to decrease later in consequence of severe head colds until, in October, 1892, when the question of an operation was considered and the hearing in the right ear was found so far decreased that Politzer's acoumeter was not heard at all, the voice within six inches only with difficulty, and the tuning-fork (562 v. s.) less than $\frac{1}{8}$ ths.

The operation, done under ether November 5th, consisted in the usual curved incision along the posterior periphery of the membrana tympani, subsequent examination showing extensive folds of mucous membrane not only horizontally but also extending downward into the fenestral niche and so far impeding access as to make the removal of the malleus and of the posterior portion of the membrana tympani necessary ; the mucous folds were then divided as far as seemed required and the blunt hook was passed behind the descending process of the incus with a view to the extraction of the stapes and dislocation of the incus simultaneously. The extraction of the stapes was effected without trouble, though with considerable resistance, gradually yielding, however, to the traction made and giving a very definite sense of suction resistance, but on withdrawal of the hook both bones flew upward and backward and disappeared behind a projecting fold of mucous membrane ; as the niche was evidently clear, and there was free oozing from the fenestra no further attempt at the extraction of the bones was made, the ear was cleansed with dry absorbent cotton and tightly stopped.

The patient's recovery from the anæsthetic was good, there was neither pain nor vertigo, and the temperature and the pulse (the latter having slowed at the instant of the extraction of the stapes) were both normal. The hearing for the voice which was within the first twenty-four hours apparently much increased, though the patient complained of difficulty in understanding what was said

to him, at the end of twenty-four hours had begun to decrease. Three days after the operation the Politzer's acoumeter was heard in the right ear eight inches, and the tuning-fork aërially $\frac{2}{3}$ ths, and there was still sero-sanguinolent oozing. December 3d the tuning-fork was heard aërially $\frac{1}{3}$ ths, and by bone-conduction over the mastoid process $\frac{1}{3}$ ths, and the voice in ordinary conversation tone at a distance of three feet. In addition to the improvement in hearing resulting from the operation, there was a very definite relief, as expressed by the patient, from certain sensations of fullness and discomfort in the head, a change which suggested incidentally the testing of the other ear, when it was found that in the left ear the Politzer's acoumeter was heard, with the right ear closed, nine inches; with the right ear open, ten inches; and the tuning-fork aërially, with the right ear closed, $\frac{1}{3}$ ths; with the right ear open, $\frac{1}{3}$ ths.

April 14, 1893, the right ear was dry, the membrana tympani had been reproduced with the exception of an opening about 3 mm in diameter, the Politzer's acoumeter was heard at a distance of twelve inches, the hearing for the voice was proportionately improved, and the tuning-fork, both aërially and over the mastoid, was heard $\frac{2}{3}$ ths.

Since this date the hearing has still further improved and the final report will be given in the concluding summary.

The length of time which has elapsed since the operation in the above case, with a steadily progressive improvement of the hearing and the retention of the dislocated ossicula in the tympanic cavity without evidence of disturbance of any kind, are points of interest. The gradual improvement in hearing, it is true, is in accord with subsequent observations in other cases, and the fact of an adequate blood supply to the stapes through the artery following the stapedius muscle and to the incus through the vessels following its posterior fan-shaped ligament, both of which attachments remained, accounts for the retention of the ossicula under conditions perfectly normal except in so far as their altered position was concerned.

That the stapes can be extracted from the niche and allowed to remain in the tympanum without injury so long as its blood supply is secured has been sufficiently proven

and the question very naturally arises in cases where the stapes is situated high above the posterior superior margin of the tympanic ring and with its stapedius tendon correspondingly inaccessible, whether extraction of the stapes without preliminary division of the tendon of the stapedius is not preferable to the form of operation first proposed in which the division of the tendon precedes the extraction of the stapes.

When also the altered relationships of the members of the ossicula chain to each other incident to the changes occurring in a chronic progressive disease of the middle ear are considered it is also a question whether in some cases an incudo-stapedectomy is not the preferable procedure.

With the secondary contraction of the tensor tympani and corresponding indrawing of the malleus and incus, the feasibility of luxation of the malleo-incudal articulation by traction upon the descending process of the incus is much increased, the fixation of the malleus by the contraction of the tensor tympani still further favoring the rupture of the malleo-incudal capsular ligament when the incus is rotated upon the long axis of its body to an extent corresponding to the excursion of the tip of the long process outward for a space of from two to four *mm*, the latter limit being reached in some instances coincidently with the contact of the long process of the incus with the superior posterior border of the tympanic ring a condition which changes the movement of the incus body from simple rotation to excursion inward and downward, thus completing the separation of the articulation.

The same process of dis-articulation by rotation is effected in the removal of the ossicles on account of caries by the use of Ludwig or Ferrer's incus hook or by the use of the curved curette, in both instances the rotation also serving to twist and rupture the fibres of the posterior ligament of the incus.

In two very similar cases in which neither the posterior ligament of the incus nor the stapedius muscle was divided and in which the stapes was extracted and the malleo-incudal articulation ruptured by simple traction of the blunt hook passed behind the incudo-stapedial joint, both bones,

when released, passed out of sight into the posterior portion of the tympanum and have there remained during a period of six months without symptoms of irritation or other evidences calling for their removal. In both cases the hearing was affected to nearly the same degree; in one of the cases the hearing to-day is sufficiently improved to have justified the operation, in the other it has not improved at all.

The three following instances of attempted stapedectomy in cases of chronic non-suppurative inflammation of the middle ear, progressive and of long duration, illustrate the observations of Schwartz¹ in reference to the changes that occur about the stapedo-vestibular articulation, and of Politzer² with reference to stapes mobilization.

Mrs. E. G., fifty-four years of age, slender and not very strong, had noticed an impairment of hearing gradually increasing and recently accompanied by annoying tinnitus; both drum-heads were indrawn and there was slight opacity not sufficient, however, to make it impossible to see the tip of the descending process of the incus. Politzer's acoumeter was heard in the right ear at the distance of one inch, the tuning-fork (562 v. s.) was heard in the right ear $\frac{1}{8}$ ths and in the left ear not at all, but by bone-conduction over the left mastoid $\frac{3}{8}$ ths tuning-forks Nos. 1 and 2 were not heard aërially with the left ear, but the Koenig's rods were heard up to 35,000 v. s.

Under these conditions and with a distinct understanding that it would probably not be successful in materially improving the hearing, operation upon the left ear was advised and was done January 13th without general anæsthesia.

Five minutes before operation, three drops of a ten per cent. solution of cocaine were injected through the Eustachian catheter, and the preliminary incision, 1 mm in length, made upon the posterior periphery, and a ten per cent. solution of cocaine applied upon a cotton-tipped probe. One minute later the cut was continued upward along the periphery and downward upon the posterior border of the malleus, without pain, apparently, except at the latter point where the discomfort seemed to have been quite as much the result of the turning of the flap outward.

The stapes was found to be high up and the tendon of the stapedius was probably insufficiently divided as after section of

¹ *Pathological Anatomy of the Ear*, p. 120.

² *Lehrbuch der Ohrenheilkunde*, Dritte Auflage, p. 264 et seq.

the incudo-stapedial articulation the stapes when extracted by means of a blunt hook passed behind the head from below, disappeared superiorly and posteriorly, the extraction of the stapes from the window being assured by the turning of the stapes upon the hook until its foot-plate became visible, at which moment it slipped from the hook and instantly disappeared.

There was no pain incident to the extraction of the stapes and no vertigo, but at the instant of the separation of the stapes from its vestibular attachment there was a sensation of shock accompanied by a loud sound, as reported by the patient, and a momentary slowing of the pulse; there was no apparent outflow of fluid from the niche. The time occupied in the operation, including the tuning-fork and voice tests made during its progress, was twenty-five minutes.

Fifteen weeks later, the ear having in the meantime completely healed, the Politzer acoumeter was not heard in the left ear, the tuning-fork was heard aërially $\frac{3}{8}$ ths and by bone-conduction over the left mastoid $\frac{4}{8}$ ths while the hearing for Kœnig's rods had decreased to 20,000 v. s.; still later the hearing for the tuning-fork had returned to what it was before the operation, without any change in the hearing for high tones.

Mrs. V. H., forty-six years of age, had impairment of hearing since childhood, slowly progressive until within the last few years and accompanied by circulatory tinnitus. Both drum-heads were transparent and the Eustachian tubes free; the Politzer's acoumeter was not heard in the right ear, and in the left only at a distance of half an inch, the hearing for the tuning-fork (562 v. s.) aërially was in the right ear $\frac{1}{8}$ ths, and in the left $\frac{3}{8}$ ths, while by bone-conduction over the mastoid it was heard in the right ear $\frac{3}{8}$ ths, and in the left ear $\frac{4}{8}$ ths. Galton's whistle was heard in the right ear up to 65 only.

The operation of stapedectomy was advised for the right ear with an unfavorable prognosis and was done January 26th, without general anæsthesia. Five drops of a ten per cent. solution of cocaine were thrown into the right nostril the head being inclined to the right and backward, and a solution of the same strength was applied in the process of making a cut in the membrana tympani which was accomplished with very little pain. The descending process of the incus and the stapes articulation were plainly visible, but the stapes was found to be firmly ankylosed in the niche.

The tendon of the stapedius was fully divided and dis-articula-

tion from the incus easily effected, but gentle traction with the hook had no effect in mobilizing the stapes, and more forcible traction resulted in fracture of both crura about midway of their length. The patient described the sensation as a distinct grating during the division of the incudo-stapedial articulation and as a sharp report accompanying the fracture of the stapes.

There was no slowing of the pulse and no vertigo.

One month later the hearing for the tuning-fork (562 v. s.) aërially in the right ear $\frac{1}{8}$ ft., with slight apparent improvement after catheterization.

One month later the tuning-fork was not heard at all aërially in the right ear, while the hearing by bone-conduction remained the same.

Mrs. A. F., forty-two years of age, had for many years considerable impairment of hearing resulting in the left ear from a past suppurative process and in the right from a chronic thickening of the tympanic mucous membrane. The Politzer acoumeter was not heard at all in the right ear, the tuning-fork (562 v. s.) was heard aërially $\frac{1}{8}$ fths and by bone-conduction over the mastoid $\frac{3}{8}$ fths. The voice was heard at a distance of four feet in an ordinary conversation tone, but was understood only within one foot, and Galton's whistle was not heard at all. In this case the long continuance of the deafness as the result of a definite sclerotic process made it probable that there would be a bony ankylosis at the base of the stapes and atrophy of the crura, which was found to be the case as, following tympanotomy under cocaine, the division of the incudo-stapedial articulation was effected with difficulty and the stapes broke through both crura, on slight traction, the head and about one half of each crura attached being carried upward and backward by the pull of the stapedius muscle. There was very little appreciation on the part of the patient of the noise made in the middle ear during the operation and the hearing was not improved.

The following case, while it resembles in some respects, both as to history and impairment of hearing, the preceding cases, differed from them in its results, and serves to illustrate the ease with which the operation of stapedectomy may be performed without general anæsthesia, under favorable anatomical conditions and in a good subject; it also illustrates one of the symptoms occasionally incident to the removal of the stapes.

Mr. D. L., sixty years of age, had a progressive impairment of hearing resulting from the changes in the middle ear originating in repeated acute inflammations of the ear in childhood. Both drum-heads were intact but much thickened and opaque; this was especially the case in the left ear, where the hearing for the tuning-fork (562 v. s.) was aërially $\frac{1}{8}$ ths, and by bone-conduction over the mastoid $\frac{3}{8}$ ths; the voice in an ordinary conversation tone was heard and but partially understood only within a distance of two feet, and the Galton whistle was heard only throughout the lower half of its register. Notwithstanding this marked impairment of hearing, the principal discomfort was caused by a deep-toned circulatory tinnitus.

The operation done May 20th was begun without the preliminary injection of cocaine and the usual incision following the posterior periphery gave little pain until the upper limit was reached, when a two per cent solution of cocaine was used and the cut continued along the superior periphery and down upon the malleus painlessly.

On completion of the opening into the tympanum the hearing for the voice and for the tuning-fork improved and the annoying tinnitus ceased, but the incudo-stapedial articulation being plainly in view and apparently ankylosed, the stapedius tendon was cut, the incudo-stapedial articulation divided, and the stapes easily extracted by means of the blunt hook without breaking and with slight suction resistance; the hearing immediately fell to zero apparently and the tinnitus returned. Within ten minutes after the operation the patient became so dizzy as to make it necessary to put him to bed, where he willingly remained forty-eight hours. There was slight nausea but no vomiting, and the vertigo decreased after a night of natural sleep, but continued when he left the hospital at the end of the second day, and in a lesser degree three days later when it was also found that the tinnitus was decreasing and the hearing improving.

Immediately after the operation in this case a paper dressing was applied, there being no evidence of serous or other fluid outflow from the niche; at the end of five days the paper dressing was dry and firmly in place.

(To be continued.)

MUCOCELE AND EMPYEMA OF THE ETHMOIDAL CELLS AND SPHENOIDAL SINUSES, CAUSING DISPLACEMENT OF THE EYEBALL; THEIR OPERATION FROM THE ORBIT.¹

By HERMAN KNAPP, M.D.

THE air in the cavities which surround the nasal passages may be replaced by liquids of different character—serous, sero-hemorrhagic, mucous, muco-purulent, and purulent. These differences have a great influence on prognosis and treatment. I purpose to confine my communication to the ethmoidal and sphenoidal sinuses, which form a group for themselves, though their affections not infrequently extend to the frontal sinuses, even to the malar antrum, and *vice versa*.

By parenthesis I may mention another cavity which is not, but might be, reckoned among the accessory sinuses of the nose. I mean the lachrymal sac. This cavity empties into the nose, and is in structure and the nature of its diseases similar to the others. It has a cushion of cavernous tissue at the orbital end of the lachrymal canal, the pathological swelling of which leads to dilatation of the sac by serum, mucus, and pus. Caries, necrosis, and polypoid formations are frequent and show the same symptoms as in the other cavities. Its diseases scarcely ever result from affections of the eye, but from those of the nose. Their treatment also is conducted on principles of nasal surgery. Thus they belong more to the rhinologist than to the oculist. An important feature the diseases of the lachrymal sac have in common with the pneumatic cavities around the nose is their tendency, in the severer cases, to encroach upon the orbit.

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My ophthalmic practice has, for many years, brought to my observation a greater number of cases of nasal disease which by their extension involved inordinate responsibility. I shall here not refer to cases which I have published, but to some recent ones that appear to be of sufficient interest to engage the attention of the reader.

CASE I.—Distension of all the cavities by a serous or sero-hemorrhagic exudation.

The serous variety has come to my notice in one example only, and this was not in my own practice, but in that of Dr. Robert Abbe, of New York, who six weeks ago was kind enough to send the patient to my clinic for an opinion. He also invited me to be present at the operation, which he performed May 15, 1893.

The patient, a girl of sixteen years, had had an obstruction of the left nostril for years. The left eye became considerably pushed out and forward, a hard, slightly uneven swelling occupied the upper half of the inner wall and the inner-upper corner of the orbit; the right eye gradually was displaced in the same way. The left eye became blind from inflammation and subsequent atrophy of the optic nerve. The right, from the same cause, is almost blind now. In this condition the patient fell into the hands of Dr. Abbe. Dr. Abbe punctured the tumor from the left orbit with an aspirator needle. The syringe filled with a brown watery liquid, which contained a great quantity of cholesterine. He then made an incision along the upper-inner part of the orbital margin, penetrated through the bony membranous wall, explored the cavity with a probe and his finger, found it $3\frac{1}{2}$ to 4" deep, very broad, and lined with soft, rather thick mucous membrane. The ethmoidal cells were one large cavity, and through a constriction the finger penetrated into the enlarged sphenoidal sinus. The cells and sinus of the other side were likewise enlarged. A very great quantity of brown, cholesterinic liquid had apparently filled all this system of cavities. Dr. Abbe passed a metallic catheter behind the soft palate, pressed its tip against the anterior wall of the left sphenoidal sinus, put his finger into the sinus, and felt the tip of the probe through the anterior wall. Guided by the catheter and his left

forefinger he then pierced the wall of the sinus with a curved, sharp-pointed tenotome, which he had introduced through the orbital wound and the ethmoidal cells. After cleansing the cavity he passed a strip of iodoform gauze through the orbital wound and the sinus into the pharyngeal cavity, pulled it out through the mouth, and filled the ethmoido-sphenoidal cavity with the continuation of the strip, thus establishing drainage into the pharynx.

May 22d.—Dr. Abbe was kind enough to write me the following notes: "The patient had a rise of temperature to 102°. Twenty-four hours after the operation I removed the gauze by the posterior wound, and inserted a tube through the opening in the orbit. The temperature rose still higher, but fell to the normal afterward. The wound is now draining freely of clear, straw-colored fluid. I have let the pharyngeal opening close, and irrigate with Thiersch's fluid. Temperature normal.

"*June 5th.*—The patient is now out of danger. The drainage into the pharynx has re-established itself, and irrigation through a small tube in the orbital sinus passes into the throat and shows no pus. The discharge is practically nothing. Nasal breathing is now free, whereas before the operation it was entirely oral. The eyeballs are less protruding; sight, perhaps, a little better. The girl is walking about and in good general health."

CASE 2.—Mucocele of the ethmoidal cells operated on from the orbit. Rapid recovery.

Mrs. F. Joseph's daughter H., æt. twenty, consulted me for the first time June 12, 1888. She had chronic coryza and was hard of hearing. The eyeball was displaced outward and downward. Through the soft parts a hardish tumor was felt extending from the inner canthal ligament to the upper orbital margin. It was immovable, painless, not fluctuating. Movements, sight, visual field, and ophthalmoscopic condition of the eye normal. The patient had had treatment for her nose, had been "burned" repeatedly but to no purpose. I found the nasal passages free and without marked intumescence of the turbinated bodies. The patient had a delicate constitution and complained of headaches. My diagnosis was mucocele or empyema of the ethmoidal cells. I advised an operation, and as she was not prepared to have it done at once, ordered boric acid spray for the nose and sojourn in the mountains. She consulted me twice more, and as there

was no improvement in the protrusion of her eye, she consented to the operation in November.

The *operation* was done at the New York Ophthalmic and Aural Institute, under ether, November 28, 1888. A curvilinear incision, about 4 *cm* long, was made from the junction of the middle and inner thirds of the supra-orbital margin, down the side of the nose as far as the ligamentum canthi internum. When the surface of the tumor was laid bare about 2.5 *cm* vertically and 2 *cm* horizontally, its wall was incised. A considerable quantity of muco-purulent, non-offensive liquid gushed forth. The cavity was explored and scraped with a sharp spoon. It went about 4 *cm* backward, not upward into the frontal sinus. It contained some granulation tissue which was removed. Its inner wall was smooth, nowhere carious. The cavity was syringed out with a solution of mercuric bichloride, 1:5000, a larger perforated silver tube with a flange put in, the upper part of the skin wound stitched up, and the whole covered with bichloride gauze and absorbent cotton, held in position with strips of isinglass plaster. There was very little hemorrhage, no diplopia, no limitations of the movements of the eye, but the left frontal region was anæsthetic. The recovery was undisturbed. No reaction from the operation, no suppuration, almost no secretion. The tube was left off on the seventh day, and the wound allowed to close. The tumor on the inner-upper side of the eye diminished in size. In about six weeks its seat felt only slightly more prominent than the corresponding place of the other orbit. I may mention that sixteen days after the operation a herpetic eruption occurred in the region of the supra-orbital nerve. It disappeared in a week, but the insensibility of that region was not restored before several months had elapsed. The patient has been seen several times since. Her recovery has been complete and permanent.

A similar case was the following:

CASE 3.—*Empyema of the ethmoidal cells, operated from the orbit. Speedy and complete recovery,*

Mrs. R. Weiler, of New York, about fifty-five years old, was brought to me by her family physician, Dr. Wiener. She had suffered from pain in the eye and surroundings for two months. No marked symptoms on the part of the nose. October 10, 1892, her left palprebral fissure was found smaller than the right.

The left upper lid drooped, but could be raised at will. The caruncle and mucous membrane lining the inner-upper part of the orbit were swollen, soft, painless. In this region a hemispherical, rather hard, but not bony, tumor was felt, more marked at the roof than at the inner wall of the orbit. H $\frac{1}{12}$, S $\frac{2}{8}$. Ophthalmoscopic condition and movements normal. The eye was slightly displaced out and downward. My diagnosis was empyema of the frontal sinus and perhaps the ethmoidal cells.

The *operation* was performed at the New York Ophthalmic and Aural Institute, November 3, 1892. A curved incision, 4 *cm* long, laid the tumor bare. On opening its wall a large quantity of pus flowed out. The sharp spoon discovered a cavity about 3 *cm* in diameter with bare and rough walls which were scraped with a sharp spoon. On probing, no communication of the cavity with the frontal sinus could be ascertained.

The cavity was syringed with corrosive sublimate, 1:5000. A large silver drainage tube was inserted, the upper part of the wound closed with sutures, and the wound dressed with corrosive sublimate gauze and absorbent cotton. The frontal region was insensible, the eye moved normally, there was no diplopia.

Several days after the operation the patient was restless, did not sleep much, had pain in the head and behind the eye. The upper lid and conjunctiva were œdematous, the eye more protruding, but there was no fever and no secretion. In a few days the swelling went down, pus escaped through the drainage tube, the cavity was syringed daily, the discharge diminished, and the patient returned to her home on the eleventh day. The drainage tube was left off three weeks after the operation. A week later she was virtually cured. The upper-inner corner was scarcely more swollen than on the other side and the eye had resumed its natural position. May 26, 1893, almost seven months after the operation I saw her again. She had been well in every respect, except that the left frontal region had not yet fully regained its sensibility.

Affections of the sphenoidal sinuses are, as far as I am aware, mostly complicated with like affections of the ethmoidal cells. The two following cases are in point:

CASE 4.—*Exophthalmus from empyema of the ethmoidal and sphenoidal sinuses. Opening from the orbit, three years*

ago. Discharge and fistula ever since. Discharge diminishing of late.

Percy Grace, of Brooklyn, æt. thirteen, consulted me first Aug. 1, 1888. Protrusion of left eye had been noticed three months previously, and increased steadily. No injury or other assignable cause. No marked symptoms from the nose. The eye was bulging and pushed to the temporal side, but freely movable. At the inner canthus a hard, round protuberance was felt on the orbital wall, almost the size of a cherry. Interior of the eye normal, V = $\frac{2}{3}$. Field complete. Diagnosis: osteoma, osteo-sarcoma, or empyema of the ethmoid,—most likely the latter. Operation advised. The patient was seen several times, but not until April, 1890, did the parents consent to the operation. The tumor and the exophthalmos had increased. No external inflammation. Optic disc somewhat raised, veins enlarged, showing pressure from the tumor on the optic nerve, probably from extension into the sphenoidal sinus.

April 21, 1890, at the N. Y. Ophthalmic and Aural Institute, under ether, the tumor was laid bare by a curved incision. Its wall could easily be cut into, a puriform, brownish liquid escaped in large quantity. The opening was enlarged. With a probe a large cavity with smooth walls, divided by a horizontal band, was made out. Careful scraping with a sharp spoon brought out no granulation tissue. The probe could be passed $2\frac{1}{2}$ inches straight backward, there being arrested by bone tissue, evidently the posterior wall of the sphenoidal sinus. Syringing liberated more of the chocolate-brown puriform tissue. Two drainage tubes were inserted, the one straight backward, the other backward and slightly upward, not so much as to enter the frontal sinus. It seems that there was a communication between the ethmoidal and sphenoidal cavities, leaving a horizontal strip between them.

There was no fever, the exophthalmus and the tumor diminished, the congestion of the optic nerve and retina disappeared. The wound was dressed and syringed daily. The same quantity of puriform liquid came out, and when one of the tubes was left off, or the syringing omitted, the wound swelled and the patient had pain in the head and behind the eye. After the operation there was some fever (temp. 101°), which soon disappeared. The patient left the hospital twenty-eight days after the operation. The contents of the cavities, examined under the microscope, contained mucus, granular detritus, and blood corpuscles.

When the fistula had existed for months without diminution of the discharge, I advised the patient to see a rhinologist, in the opinion that an internal opening might be established which, if it did not cure the discharge, might at least remove the necessity of the permanent external fistula. The walls of the nasal passages were not conspicuously abnormal. Dr. Lincoln took charge of the patient, removed portions of the lower and middle turbinated bodies, opening the ethmoid cells. It had a good effect upon the width of the nostril, but not on the discharge, and to this day the fistula, with two silver tubes, has persisted, giving no other discomfort than its mere presence. The discharge has, of late, become scant, and the liquid injected escapes through the nose. There is some hope for an ultimate recovery. The silver tubes have blackened the skin near the fistula. I advised the boy to replace them by gold ones.

The next is a parallel case to the preceding.

CASE 5.—Empyema of the ethmoidal and sphenoidal sinuses. Exophthalmus. Operation from the orbit. Thus far (four months) persistence of external fistula, but with diminishing secretion.

Sam. Hasslacher's son, J. G., æt. fifteen, Scranton, Pa., consulted me, December 12, 1892. For many years has had offensive discharge from the nose, and for the last three years exophthalmus of varying degree on the left side. Eye pushed forward and downward. S $\frac{1}{2}$. Mobility, tension, field, and fundus normal. No nasal or pharyngeal disease. Posterior rhinoscopy impossible, but palpation shows pharynx to be free. An immovable, hemispherical, slightly uneven tumor, not so hard as bone, the size of a large split cherry, occupied the upper-inner angle and the upper half of the inner wall of the orbit. I advised operation, and, with the mother's consent, performed it under ether at the "Institute," January 26, 1893. The incision through the wall of the tumor evacuated a great deal of brownish muco-pus. On probing the cavity extensive caries was found in different directions. No communication with the frontal sinus could be established. The wound was dressed and the cavity syringed every day. On February 1st and 2d the upper lid and the tumor swelled again and the discharge stopped. February 3d I enlarged the wound and made it deeper. A good deal of blood and muco-purulent sub-

stance escaped. A new posterior cavity, evidently the sphenoidal, had now been opened, for the probe could be introduced 6 *cm* straight backward. The cavity was scraped with a sharp spoon, but nothing worth mentioning was brought out. There had been some fever (temp. up to 101°), but it soon disappeared. The middle turbinated was somewhat swollen. When the patient blew his nose, more secretion came through the canula; several times when the wound was syringed out the liquid entered the nose. The discharge through the silver tube formed in considerable quantity and was regularly syringed out. As it showed no tendency to diminish, I called in consultation Dr. T. Myles, whose anatomical demonstrations of the nose have received so much attention. He examined the patient several times, found enlargement of the middle turbinated, and proposed to make a counter-opening into the nose. Knowing how difficult it is to keep such perforations open, I wanted to treat the patient for a time yet by syringing out the cavity through the external fistula. He improved very satisfactorily, and left the hospital March 7, 1893. The exophthalmus and the tumor have almost disappeared; the interior of the nose shows less swelling, and the patient went home May 10th, to continue the treatment and report again later.

I may add here the report of a remarkable case which I saw only twice, in the year 1887. At the time the diagnosis was a puzzle to me, but became clear, I think, from the subsequent history.

CASE 6.—Exophthalmus with rapid loss of sight from empyema of the sphenoidal sinus.

A strong, healthy-looking gentleman, C. K. D., æt. fifty, of St. Paul, consulted me February 10, 1887. He told me that three months ago, after many exposures and great exertions in stump speaking for four months, his left eye protruded enormously down and out, the lids were swollen; the sight had diminished, first in the centre then on the sides; in four days it was lost completely. At the same time he had articular rheumatism. The protrusion of the eye began to diminish five weeks later. I found the eye still somewhat prominent but free from pain. Optic disc white; arteries small, pulsating on pressure. Sight totally lost. Right eye normal. He has been an excessive smoker, fifteen to twenty

cigars a day ; has drunk but little. These are my notes, and I regret that I did not examine his nose carefully, but there was nothing to draw my attention to a difficulty in the nose. Examination of the orbit by palpation and otherwise discovered no cause for the exophthalmus. An information which I accidentally received later makes the diagnosis of this case clear. On enquiry Mr. D. was kind enough to write me a letter of which the following is of importance : "I had no particular difficulty with my nose previous to my ear trouble, except perhaps a slight catarrh. After I saw you the left nostril began to be obstructed and finally closed up completely. So I went to Dr. Gardner who is not a specialist but a very accomplished man. He pronounced it polypus and proposed to burn it out by electricity. As he was burning away the hot instrument gave a plunge and a large quantity of pus came from my nose, which in my opinion settled the cause of my blindness."

In the light of our present knowledge we may fairly suppose that this was one of those cases of empyema of the sphenoid which cause exophthalmus and sudden blindness.

In conclusion I beg to report an example of—

CASE 7.—Empyema of all the sinuses, which terminated fatally by meningitis.

The patient, Catherine Burckhard, of Brooklyn, a stout woman of fifty-seven years, was brought to my clinic at the College of Physicians and Surgeons January 3, 1893. Her left upper eyelid and the skin over the lachrymal sac were shining, red, hard, and swollen. The eyeball was displaced downward and outward. In the upper-inner corner of the orbit and some distance down the inner wall a moderately hard swelling was felt. It was immovable and sensitive to the touch. The patient had suffered long from naso-pharyngeal catarrh. I diagnosed empyema of the left frontal sinus and ethmoidal cells. The same day, before the students, I made an incision in the swollen skin at the inner-upper canthus. Not striking pus at once, I enlarged the incision, laid the tumor bare, cut into its wall, and evacuated a considerable quantity of thin pus. The probe penetrated upward into a large cavity, through the left frontal sinus into the right. The cavity was syringed out and drained with a silver tube. The patient was admitted to the New York Ophthalmic and Aural

Institute. At first some pus flowed through the tube, but then it stopped and the patient felt bad ; her temperature went up to 103° and 104° . It was reduced by antipyrine and antifebrine. Thin, sanious pus then came out through the tube. The temperature kept high, the pulse was 130 and 140 on January 14th. She felt weaker, had a sallow skin, pinched features, relaxed sphincters, and died suddenly January 15th, at 1:30 A.M.

The autopsy, made on the same day, showed purulent meningitis at the base and convexity. The pus communicated through the cribriform plate of the ethmoid and defects in the roof of the orbit with the nasal cavity and the frontal and ethmoidal cells. All the sinuses contained thin pus, and had white, even walls with scarcely any lining of mucous membrane. The left antrum of Highmore was filled $\frac{1}{3}$ of its size. Necrosis was seen nowhere, but caries in many places, also on the surface of the left middle turbinated bone.

The autopsy showed that there had been caries and suppuration in all the accessory sinuses of the nose. The left frontal and ethmoidal cavities were distended toward the eye. A fresh acute suppuration had started in them at her last illness ; it extended into the brain and caused her death.

REMARKS.

Reviewing the cases under consideration, we find the different kinds of exudation represented. In the *first* (Dr. Abbe's) there was a sero-sanguineous exudation full of cholesterine. These cases may be rare, but they are not unknown, and I think that Dr. J. H. Bryan, in the *System of Diseases of the Ear, Nose, and Throat*, edited by Dr. C. H. Burnett, goes too far when, vol. i., p. 473, he says : " Under the term hydrops antri was formerly described an affection characterized by an accumulation of serous fluid in the antral cavity, containing cholesterine, and accompanied by a distension of the anterior wall of the sinus. These were, in all probability, cases of dentigerous cysts. Hydrops of this cavity, in its true sense, does not exist, and the term should be dropped from our list of diseases as misleading."

To this statement I may reply that a dental cyst will not

fill all the sinuses as it did in Dr. Abbe's case, and there was nothing in these sinuses but serous fluid and cholesterine.

The *second* case was a plain and pure mucocele of the ethmoid cells. The opening from the orbit afforded a thorough evacuation of the cavity; there was no subsequent discharge, no fistula. Primary union and permanent recovery was the result of the operation.

The same happy termination was noticed in the *third* case, though the contents of the cavity were more purulent than mucous.

Why certain cases recover so readily, while others do not, apparently under the same conditions, is a matter of conjecture. The conditions of the walls of the cavity—ulcers, caries, necrosis, granulations, and polypi—play, no doubt, an important part in the mode of healing in such cases, and therefore it is necessary to examine carefully with a probe the walls of the nostrils before the operation, and with straight and bent probes and sharp spoons the walls of the cavities during and after the operation. Caries and necrosis are probably the cause of the protracted healing or incurability of many cases, just as chronic otorrhœa in many cases is cured only by a thorough removal of all the dead substances in the drum cavity and its surroundings. The patency, stenosis, or closure of the mouths of these cavities no doubt have also something to do with the formation and retention of morbid material, as we daily see in lachrymal diseases. If there is stricture in the tear duct and no inflammation in the sac, clear watery liquid can be pressed out (*hydrops sacci lacrymalis*), but if inflammation is present, the contents of the tumor are either mucus or pus. It is remarkable that the accessory cavities are not more frequently the seat of retained liquids than we are aware of, for their orifices are mostly small, and all situated in the upper portions of their walls. The reason of this, it seems to me, is that the exudations disappear not so much by flowing out through the mouths of the cavities as by natural absorption as soon as their source, the productive inflammation, is removed. Collections of pus in the anterior chamber vanish when the corneal abscess by nature, galvano-

cautery, or other treatment is converted into a clean, non-secreting ulcer. It is well known that during acute coryza the neighboring cavities fill with secretion which disappears when the coryza is over.

The *fourth* and *fifth* cases were empyemas of the ethmoidal and sphenoidal sinuses in which the operation cured the orbital tumor and the exophthalmus, but the secretion has continued, though diminished in quantity. Under the microscope the peculiar puriform secretion shows the element of pus, but in the last case which I examined bacteriologically no micro-organisms were found.

The *sixth* case, exophthalmus with rapid blindness, is very important and certainly rare. In literature several such cases are mentioned, but I know of no other example in my own experience. It shows that oculists, when they come across a case of exophthalmus, without a tangible cause in the orbit, should think of a possible affection of the sphenoidal sinus, especially when the exophthalmus is acute and connected with conjunctival swelling and impairment of sight. I imagine that empyema of the sphenoidal sinus may exist for a long time without producing eye symptoms; then suddenly, as we see in chronic dacryo-cystitis, an acute abscess develops, which makes the tissue in the apex of the orbital pyramid congested and oedematous, participating in the inflammation, and compressing the optic nerve before or after its entrance into the optic foramen. This may lead to optic neuritis, or, as we see in erysipelas (of which I published a typical case in the *Arch. of Ophthal.* vol. xiii., p. 83), to compression of the arteries and veins in the orbit, retinal hemorrhage, and thrombosis. Both conditions may cause optic nerve atrophy. The periodic oedema of the subconjunctival tissue, accompanied by more or less protrusion of the eyeball, which, for want of a better diagnosis, is called tenonitis, may also be caused by transient inflammations of the sphenoidal or posterior ethmoidal sinuses. Under all circumstances it is well for oculists to keep this possibility in mind. The case under consideration had been diagnosed by nobody, though it was seen by many.

In the *seventh* case, empyema of all the sinuses, the pus

had evidently made its way into the cranial cavity through the cribriform plate and the defects in the upper wall of the frontal sinus when the patient presented himself. The operation came too late to save his life.

I abstain from making any remarks about the diagnosis of mucocele and empyema of the ethmoidal and sphenoidal sinuses, as they are well enough treated in most text-books. Some good monographs may be specially mentioned.

E. BERGER and J. TYRMANN: *Die Krankheiten der Keilbein-Höhle u. des Siebbein-Labyrinthes u. ihre Beziehungen zu den Erkrankungen des Sehorgans.* Wiesbaden, J. F. Bergmann, 1886.

E. BERGER: *Rapports entre les Maladies des Yeux et celles du Nez et des Cavités Voisines.* Paris, O. Doin, 1892.

L. GRÜNWALD: *Die Lehre von den Naseneiterungen mit besonderer Rücksicht auf die Erkrankungen des Sieb- u. Keilbeins u. deren chirurgische Behandlung.* München and Leipzig, J. L. Lehmann, 1893.

SCHÄFFER: *Chirurgische Erfahrungen in der Rhinologie u. Laryngologie.* Wiesbaden, J. F. Bergmann, 1885.

The *treatment* of these diseases is very important, as spontaneous recovery has scarcely ever been observed, whereas surgical interference is not dangerous to life, benefits almost all cases, and produces a permanent, perfect cure in many.

Care of the nose, if there is disease, should not be omitted. When exophthalmus is present, *i. e.*, when the orbital wall has yielded, treatment of the nose alone has rarely been attempted, and only in exceptional cases proved successful. Yet, in my opinion, it deserves to be more extensively tried.

The ethmoidal cells may be opened from the middle meatus, where a pointed instrument at the hiatus semilunaris will readily penetrate into the anterior cells. This may, in many cases, be sufficient for the complete evacuation of pus and subsequent irrigation, as frequently the pathological process breaks down the partition walls of the cells. In other cases the perforation has to be placed higher up, and farther back into the upper meatus. In the majority of such cases the middle turbinated bone has to be

pierced, especially when the medial wall of the cells is conspicuously bulging (Zuckerkindl's bulla ethmoidalis).

The opening of the sphenoidal sinus can in some cases, as Schäffer has proved, be done according to the proposition of Zuckerkindl, by passing the instrument over the medial side of the middle turbinated bone into the upper meatus, and piercing the upper part of the anterior wall of the sinus where its natural orifice is. In the majority of cases it will be necessary, however, to remove a portion of the middle turbinated in order to get free access to the anterior wall of the sphenoidal sinus. The openings into these cavities should be as large as possible and kept free by daily syringing and the use of a sharp spoon. I need not mention that immediately after opening the sinuses, their walls should be explored with straight and curved probes, and scraped with a sharp spoon if polypi, caries, and necrosis are present.

All these operations are new and I have no personal experience in them. They appear rational and I am ready to perform them in suitable cases. Their great drawback lies in the difficulty of keeping the perforations open. Even broad resections of the inner wall of the malar antrum in the lower nasal meatus could in certain cases, says Grünwald, by the most persistent care, not be prevented from closing so that it was necessary to establish a permanent fistula in the canine fossa.

Operating in the depth of the nose is particularly difficult on account of the narrowness of the canal in which the instruments have to work, and on account of the bleeding which, in spite of cocaine, often is profuse. A few weeks ago I extirpated an intranasal cyst (a mucocoele) the size of a large walnut, by detaching, according to Dieffenbach, the wing of the nose from the cheek through an incision of an inch in length. The wing being held upward with a tenaculum I had a sufficiently free field before me to remove the whole tumor. The wound healed by first intention. I got the impression that this incision might be very useful in many intra-nasal operations.

I am quite familiar with operating on the accessory cavities of the nose from the orbit, be it for empyema, osteoma,

or sarcoma. This mode has the advantage of exposing the cavities to view. For the upper sinuses, the frontal, ethmoidal, and sphenoidal, the incision is curvilinear along the brow and nose. The surface of the tumor is laid bare and an exploratory incision will reveal its character if it has not been ascertained before by an aspirator needle. In the case of mucocele or empyema, a large incision is made into the wall of the tumor, and when probing or scraping discovers caries or polypi a portion of the wall should be excised so as to lay the cavity largely open, examine its walls, and act accordingly, as we do in mastoid operations. In uncomplicated cases a silver drainage tube may be sufficient to produce a speedy recovery. In cases complicated with caries, etc., the cavity has to be carefully cleansed of all morbid substances with a sharp spoon, irrigated, and filled with sublimate or iodoform gauze; then cleansed and irrigated every day until the exophthalmus and orbital swelling have disappeared and the discharge has ceased. Treating the nostrils, if there is any need for it, should not be neglected. When such treatment has been continued for months or years a counter-opening into the nasal passages may be made and a metallic or rubber tube passed from the orbital wound into the nose. Irrigation and removal of granulations and carious or necrosed bone is all we can further do. If under this treatment recovery is not obtained, a permanent external fistula has to be accepted as a compromise. The operations from the orbit *per se* are of no danger. The naturally easy drainage prevents propagation into the deeper parts. In the cases which I have seen terminate fatally the meningitis had always started before the operation was made, or the disease—polypi or sarcoma—was so extensive as to render a radical removal impossible.

During the operation the frontal nerve is cut, which leaves an anæsthesia for a number of months without any consequences.

The avoidance of injuring the pulley or tendon of the superior oblique muscle has always to be kept in mind during the operation, lest diplopia be the result. This accident has never occurred to me and I think it need not

occur. The pulley is attached to the inner side of the periorbita, close by the supra-orbital notch. By carrying the incision at the edge of the orbit both up and inward, the pulley falls outside of it, so much the more as the expansion of the inner-upper angle of the orbit through the tumor crowds the pulley away from the margin. It is prudent, however, to be careful while detaching the periosteum from the tumor and use a spatula for that purpose, rather than a sharp knife. An anatomical specimen which I beg to demonstrate, and which every one can easily prepare for himself, will make those relations clear.

In conclusion, gentlemen, let me say that the subject which I have taken the liberty of submitting to your consideration has an old but scant and widely scattered literature; yet not until very recently has it been systematically studied. The impulse to this systematic study has been given not by general surgery, nor by ophthalmology, but by the highly gratifying development of modern rhinology.

MISCELLANEOUS NOTES.

I.—BRITISH.

A.—MEETINGS OF SOCIETIES.

HARVEIAN SOCIETY.—At a meeting held on February 2d, Mr. Edward Owen read a paper on Post-Nasal Growths in Children, and showed two interesting cases in which the normal pharyngeal tonsil could be seen through wide clefts in the palates of the patients. A most interesting discussion followed, in which Mr. Butlin, Mr. Mark Hovell, Drs. Scanes Spicer, Felix Semon, Silk, and others took part. The general opinion appeared to be that instrumental removal by means of forceps or a curette was much to be preferred to simple scraping with the finger-nail, and that the patient should be carefully anæsthetized in the recumbent position.

NORTHUMBERLAND AND DURHAM MEDICAL SOCIETY.—At the meeting held on February 9th, Dr. Robertson exhibited an example of Bezold's mastoiditis, and also a specimen of post-nasal sarcoma removed by means of the galvano-cautery snare.

LEEDS AND WEST-RIDING MEDICO-CHIRURGICAL SOCIETY.—At the meeting held on February 17th, Dr. Adolph Bronner showed specimens illustrating the anatomical relations of the lateral sinus, mastoid cells, attic, and middle ear.

CLINICAL SOCIETY OF LONDON.—At the meeting held on March 10th, Mr. Raymond Johnson gave particulars of a case in which he had excised the tonsil for sarcomatous disease, the secondary glandular growths being removed at the same time. The external carotid artery was first tied, and all the diseased structures were removed through the incision in the neck.

PATHOLOGICAL SOCIETY OF LONDON.—At the meeting held on March 21st, Dr. George Stoker related a case in which the history pointed very directly to an attack of pulmonary hæmoptysis, but in which the blood spitting was found to be actually due to a papillary fibromatous mass attached to the middle and lower turbinated bones. The hæmoptysis ceased on removal of the diseased tissue.

BRITISH MEDICAL ASSOCIATION—Birmingham and Midland Counties Branch.—At the meeting on February 24th, Mr. Marsh showed a man, aged twenty-one, suffering from primary lupus of the epiglottis. Griqualad West Branch (Africa).—At the March meeting, 1892, Dr. Matthias read a paper on Otorrhœa, advocating the use of an irrigator for washing out the tympanum and Eustachian tube. At the July meeting Dr. Watkins read the notes of a case of post-pharyngeal abscess. At the November meeting Dr. Symonds showed a button removed from the nose after twenty years.

BRADFORD MEDICO-CHIRURGICAL SOCIETY.—At the meeting held on March 7th, Dr. Adolph Bronner read a paper upon Naso-Pharyngeal Diseases, and a discussion followed. At the meeting held on May 2d, Dr. Kerr made some remarks and showed specimens from a child aged seven, that had died after trephining the mastoid cells for symptoms secondary to chronic middle-ear disease. Recent infective infarcts were found in the lungs.

CLINICAL SOCIETY OF MANCHESTER.—At the meeting held on March 21st, Dr. Milligan showed patients in whom Stacke's modified mastoid operation for suppurative middle-ear disease had been performed with satisfactory results.

ROYAL ACADEMY OF MEDICINE IN IRELAND.—At the meeting held on February 24th, Dr. O'Carroll showed a specimen of pachymeningitis from a boy aged ten; the result apparently of an extension of the inflammatory process from the middle ear.

MEDICAL SOCIETY OF LONDON.—At the meeting held on April 24th, Mr. Spencer Watson exhibited a mucous polypus of unusually large size that he had removed from the right nasal fossa of a patient.

HUNTERIAN SOCIETY.—At the meeting held on April 25th, Dr. Stowers communicated the particulars of a case of melanotic sarcoma of the left ear in a girl aged eleven. Microscopic sections of the growth were also shown.

B.—APPOINTMENTS.

J. W. BARRETT, M.D., Ch.M. Melb., F.R.C.S. Eng., has been appointed Honorary Surgeon to the Victorian Eye and Ear Hospital, Victoria, Australia, *vice* Bowen, resigned.

P. S. WEBSTER, M.D. Durh., M.R.C.S., L.R.C.P. Lond., has been appointed Honorary Assistant Surgeon to the Victorian Eye and Ear Hospital, Victoria, Australia.

C.—NEW SOCIETY.

We have much pleasure in recording the formation of a new Society, viz., THE LARYNGOLOGICAL SOCIETY OF LONDON, the first general meeting of which was held in the last week in March. The officers of the Society are as follows: PRESIDENT: Sir George Johnson, M.D., F.R.S. VICE-PRESIDENTS: Felix Semon, M.D.; P. McBride, M.D. TREASURER: Mr. H. T. Butlin. LIBRARIAN: F. de Havilland Hall, M.D. SECRETARIES: E. Clifford Beale, M.B.; Scanes Spicer, M.D. COUNCIL: Mr. Cresswell Baber, Dundas Grant, M.D., Greville MacDonald, M.D., D. Newman, M.D., W. McNeill Whistler, M.D. We cordially wish the Society every success.

II.—AMERICAN.**A.—MEETINGS OF SOCIETIES.**

The regular meeting of the New York Otological Society was held May 23, 1893, at 8 P.M., at the office of Dr. E. B. Dench, 17 West 46th Street.

Dr. H. A. Alderton exhibited a tube which he had found useful in cases of otitis externa, both for securing drainage and affording the patient a means of thoroughly irrigating the ear.

Dr. E. B. Dench presented an improved Galton whistle, upon which any note from 1024 vibrations per second to 32,000 vibrations per second could be sounded. The device was intended to

replace the higher tuning-forks used in the functional examination of aural cases.

Dr. Gruening called attention to the misuse of the term "Post-aural Abscess," as occurring in children. He believes that the condition is always due to mastoiditis, and that in every case a thorough operation should be done, the antrum opened freely, and any other cells present should be thoroughly exposed and curetted. After such an operation the middle ear usually needs no attention, and suppuration ceases at once. In the discussion which followed Drs. Bacon and Dench agreed with the speaker, and Dr. Dench called attention to the danger of necrosis of the squamous portion of the temporal bone and perforation into the cranial cavity in cases where free drainage was not secured. He cited two cases reported in detail. Dr. Pomeroy had also reported a similar case, and believed that in every instance a swelling of the tissues behind the ear in children called for external incision. Drs. Friedenbergs and Knapp thought that simple incision often sufficed; the last-named speaker has seen spontaneous recovery and called attention to the fact that œdema of the tissues might simulate a deep-seated purulent collection.

Dr. Knapp reported a case in which a sebaceous tumor of the oil cyst variety originating in the ear canal had, after perforating the membrana tympani and the cartilaginous portion of the canal, finally appeared as a tumor behind the auricle. The diagnosis as to the local condition was difficult, owing to the obliteration of the external meatus by its swollen posterior wall. The contents of the cyst were evacuated by an incision behind the ear, and drainage effected by means of a silver tube inserted at first into the wound and later into the external meatus. Under the microscope the tumor clearly showed the transition from a sebaceous to an oil cyst.

Dr. J. E. Nichols reported a case in which he had removed a lipoma as large as a hen's egg from the posterior surface of the auricle close to its line of insertion. The tumor at first appeared to be cystic, but a histological examination revealed its true nature.

Dr. J. E. Sheppard reported two cases of mastoid caries occurring in diabetic patients aged fifty-one and fifty-eight years, respectively. Both cases were operated on successfully. In both the tissues seemed to possess less reparative power than usual, as

evidenced by the excessive production of granulation tissue in one instance, and profuse suppuration in the other.

Dr. Bacon remarked that in his opinion diabetes in advanced life would make him hesitate about performing any serious operation.

Dr. Knapp expressed the opinion that although the presence of diabetes rendered patients more susceptible to suppurative processes, it did not of itself contra-indicate operative interference if necessary.

Dr. Bacon referred to a case, presented at a previous meeting, in which, as a result of chronic mastoid inflammation, the external canal had been almost obliterated. It had been a question whether the disease was not of a tubercular or syphilitic nature. Upon operation the posterior wall of the canal was found to be carious; all softened bone was removed and the patient made a prompt recovery.

Dr. Knapp remarked that tubercular mastoiditis might occur without involvement of the middle ear, and advocated the use of cod-liver oil in these cases.

Dr. Bacon mentioned two cases of hereditary syphilitic disease of the ear which had improved upon large doses of the iodide of potassium. He also cited an instance, reported by S. Buck, in which this same treatment had proved efficacious.

Dr. Knapp was certain that no decided improvement was effected in these cases by the iodide, and in this opinion he was supported by Dr. Gruening, who advocated the use of pilocarpine.

Dr. Buck, referring to the case he had reported, was certain of the marked improvement following the use of iodide of potassium in large doses.

Dr. Dench reported a case of facial paralysis of ten days' duration, caused by a cholesteatomatous mass in the upper part of the tympanic cavity. The hearing had been very poor in the ear for fifteen years or more, and there had been previous slight attacks of facial paresis which had disappeared spontaneously. Examination revealed that the tympanic cavity had been the seat of a previous suppurative process, although no history of this could be obtained. The remains of the membrana tympani, the malleus and incus, and the cholesteatoma were removed through the canal. The malleus, incus, and superior wall of the canal at its inner extremity were carious. All softened bone was removed with the curette, and as the process seemed limited to the tym-

panic cavity the mastoid was not opened. The patient made a complete recovery; the paralysis disappeared completely, the hearing became very good, and the ear remained free from discharge.

Dr. Buck called attention to the frequency of mastoid sclerosis in cases of cholesteatoma, which had also been the experience of the previous speaker.

Dr. Nichols reported a case of *aspergillus* recently seen in which a piece of silk formed the nucleus of the foreign deposit. The mycosis was of a variety frequently found in horses.

Dr. Pomeroy called attention to the value of powdered cocaine both as a styptic and anæsthetic in middle-ear operations. In his experience the results were much more satisfactory than with the strongest solutions.

PHILADELPHIA COUNTY MEDICAL SOCIETY, June, 1893.—At the regular meeting of the society Dr. B. Alexander Randall made some excellent remarks upon the mastoid operation. It is his opinion that the operation should be radical in its nature, and that all diseased tissue should be completely removed. Care upon the part of the operator, and attention to the anatomical peculiarities exhibited by each particular mastoid at the time of operation, will usually enable the surgeon to avoid important structures or to protect them from violence. Cranial measurements are of no value in determining the position of the sinus or middle cerebral fossa in any case.

The speaker strongly advocated the performance of such operations by the otologist rather than by the general surgeon.

B.—APPOINTMENTS.

Dr. Edward B. Dench has been appointed Professor of Otology at the Bellevue Hospital Medical College, New York, and

Dr. Justine L. Barnes, Adjunct Professor of Otology at University Medical College, New York.

C.—EDITORIAL NOTICE.

Nos. 1 and 2 (double number) of vol. xxiv. of the German edition of these ARCHIVES issued in April, 1893, contains the following, not yet translated papers:

1. BEZOLD, average hearing power in old age.
2. BLOCH, binaural hearing.

3. STEINBRÜGGE, the depression of Reissner's membrane.
4. SUCHANNECK, microscopy of the human nasal cavity, especially the olfactory membrane.
5. SCHMIEGELOW, cases of mastoid disease.
6. Moos, new tuning-forks.
7. Moos, diagnostic value of percussing the mastoid.

All these papers will appear in extenso or abridged in the English edition as soon as practicable.

ARCHIVES OF OTOTOLOGY.

THE STACKE OPERATION FOR CARIES INVOLVING THE MIDDLE EAR¹ AS MODIFIED AND PRACTISED BY PROF. HERMANN SCHWARTZE, WITH AN HISTORICAL SKETCH, METHOD OF OPERATING, AND REPORT OF TWELVE CONSECUTIVE CASES.²

By DR. C. R. HOLMES,

OPHTHALMIC AND AURAL SURGEON TO THE CINCINNATI HOSPITAL; CLINICAL PROFESSOR OF OTOTOLOGY, MIAMI MEDICAL COLLEGE, ETC.

(*With ten figures in the text.*)

HISTORICAL. — The anatomist Johannes Riolan, 1649, was the first to *propose* the operative opening of the mastoid for the relief of deafness and tinnitus when due to stenosis of the Eustachian tube. J. L. Petit († 1750) is quoted by von Tröltsch as being the first who *performed* the operation.

Jasser, a German military surgeon, performed the operation in 1776, upon a soldier, for the relief of suppuration and pain, and for a long time it was named "Jasser's Operation." This clouding of Petit's glory is perhaps explained by the fact that his operation was not published until 1774, twenty-four years after his death.

Jasser's report caused widespread interest, and the operation unfortunately came to be regarded *as a cure for deafness from any cause*. Naturally such abuse soon led to unfavorable results and the first death from the operation occurred in 1791. The victim was no less a personage than Baron

¹ Under the heading "Middle Ear" we include tympanum, attic, antrum, and mastoid cells.

² That part of this paper which relates to the report of cases, was read in the section on Laryngology and Otology of the American Medical Association at Milwaukee, June 7, 1893. An abstract of it will appear in the Journal.

Dr. von Berger, physician to the King of Denmark. Von Berger, then an old man, and suffering greatly from deafness, dizziness, and subjective noises, requested Professor Kölpin to perform the operation. Meningitis developed and death resulted on the twelfth day. The death of von Berger caused the operation to be almost universally abandoned for about seventy years. Even Sir William Wilde, who has been called the Father of Modern Otology, declared himself against the opening of the bone, although he introduced the periosteal incision that bears his name to-day.

In 1860 Forget¹ reported a case operated upon eleven years before, and at the same time, but independently, von Tröltsch in his *Anatomy of the Ear*, advocated the opening of the mastoid in cases where there was retention of pus, or diseased bone. He was especially successful in calling attention anew to the value of the operation, by an article published in *Virchow's Archives* in 1861, wherein he also reported a case of purulent otitis following scarlet fever, in which the perforating of the carious mastoid with a probe was sufficient to bring about rapid improvement.

Turnbull, in 1861, reported a successful case,—the first in this country.

In 1863 Schwartze reported one case where, after a Wilde incision and evacuation of pus, the diseased bone was perforated.

In most of these cases there had been no sharp instruments used to open the bone directly, but the fistulous openings in the diseased and softened bone were generally enlarged by the aid of blunt probes and the cavities syringed. But we now begin to find records of cases where drills and other cutting instruments were used.

The reports of operated cases from this time on became more frequent—Triquet² in 1864; L. Jacoby³ and Pagenstecker⁴ reported several cases in 1868; Kessel⁵ in 1869,

¹ *L'Union Méd.*, No. 32.

² *Gaz. des Hôp.*, 1864.

³ *Archiv für Ohrenheilkunde*, vol. iv.

⁴ *Ibid.*, vol. i.

⁵ *Ibid.*, vol. iv.

three cases; Schwartz¹ and Koppe in the same year reported two cases of reflex epilepsy with caries of the temporal bone,—cured by an operation; Roosa² and Agnew³ in 1870; and A. H. Buck⁴ in 1871. In 1872 D. R. Ambrose reported one case, and from Professor Volkmann's clinic five cases were reported by Shede.

Up to this time the results of the operation were far from satisfactory, and the old deeply-rooted opposition was encountered on every side by the few who had the courage to undertake it. Nor had there been any thorough study made of the great variation in structure of the temporal bone, and the resulting danger the surgeon must encounter when operating. The technique of the operation was also far from being perfect. To remedy this, Schwartz and Eysell made an exhaustive study of the temporal bone in health and disease, and the results of their investigations were published in 1873. This publication contained a history of the operation up to that time, also chapters on anatomy, physiology, pathology, and the indications for the operation and manner of performing the same. They also strongly advocated the *mallet and chisels* in preference to the drill or trephine. The article ended with a report of seventeen cases operated upon by Schwartz. This work was so thorough and convincing that the operation gained many supporters, and it gradually ceased to be regarded as a procedure permissible only as a last resort in rare instances, and began to rank as an invaluable addition to existing therapeutics.

The rules or indications for the operation which Schwartz formulated in his early works have been universally accepted as authoritative. The slight changes they have undergone are the outgrowth of advances in surgery, and a more intimate knowledge based upon experience and study. A translation of the rules, as found in his last publication,⁵ is given below :

“ 1. In acute primary and secondary inflammation of the

¹ *Ibid.*, vol. v., 1869.

² *Med. Record*, July, 1870.

³ *Transactions of the American Otological Society*.

⁴ *Med. Record*, 1871.

⁵ *Handbuch der Ohrenheilkunde*, 1893.

mastoid, when after the use of antiphlogistic remedies (especially ice applications) the pain, swelling, and fever does not subside in a few days—eight days at most.

“2. In chronic inflammation of the mastoid, with recurrent swelling, or with existing abscess formations and superficial fistulæ, with gravitating abscesses along the side or towards the nape of the neck, in the external canal or towards the pharynx; even if there are no life-threatening symptoms.

“3. In chronic purulent inflammation of the middle ear without any external evidence of inflammation of the mastoid, when there is any probability of symptoms developing that might cause dangerous complications as a result of pus retention or cholesteatoma formation.

“4. In otherwise incurable neuralgia of the mastoid.

“5. As a prophylactic operation against fatal results developing from foetid middle-ear discharge without any visible inflammation of the mastoid, and without signs of pus retention (pain, fever) whenever after a careful examination it is proven that the seat of the purulent secretion is not limited to the tympanum.”

Up to 1873 the operation had been performed only when the inflammation (acute or chronic) assumed such proportions as to threaten life.

At this time, as a result of the more careful study of the pathological changes of the ear, a new operation developed, *i. e.*, *excision of the ossicles* through the normal external canal. In 1873 Schwartze was probably the first to remove the membrana tympani and hammer. Kessel removed both hammer and anvil about the same time. This operation did not attract much attention until within the last few years, and its value and scope are still to be determined. The following indications for the operation are given by Schwartze.¹

“The excision of the hammer and anvil is indicated:

“(a) As a cure for chronic purulent discharges from the attic without taking the still existing hearing capacity into consideration,

¹ *Handbuch der Ohrenheilkunde*, Band ii., p. 768.

" 1. In caries of the hammer and anvil.

" 2. In chronic purulent discharge in the tympanic cavity without positive signs of caries of the hammer and anvil ;

" 3. In cholesteatoma in the tympanic cavity ;

" (*b*) For the improvement of hearing and the cure of subjective noises,

" 1. When there is fixation of the hammer on account of total calcification of the ear-drum, anchylosis of the hammer-anvil articulation, or synechiæ of the membrana tympani with the promontory, if by a trial incision in the membrana tympani, with resulting improvement of hearing, deep-seated obstructions in the path of the sound-waves to the window of the labyrinth, such as synostosis of the stirrup, and labyrinth affections, such as nerve deafness, can be excluded through exact qualitative hearing tests. Ability to hear the voice must still exist,

" 2. In incurable obstruction of the Eustachian tube. When by a trial puncture of the retracted drum membrane a substantial, though temporary, improvement in hearing results, with accompanying replacement of the drum membrane (?) (See below) ;

" 3. In sclerosis of the tympanic cavity with no sign of nerve deafness, when each catheterization is followed by an objective, measurable, but quickly vanishing improvement in hearing, and diminishing of the noises in the ear, and the same result is gained by a trial puncture of the ear-drum (?) (See below)."

It will be noticed that Schwartze has placed an interrogation mark after indication 2 and 3, under heading *b*. The reason for this is explained in the following translation from his recent work :¹

" The chances are more unfavorable when the excision is made where stenosis of the Eustachian tube exists, as the result, although very satisfactory, is only temporary, and the good effect disappears entirely again with the reproduction of the ear-drum. This comparatively rare indication will only be sustained in the future if a sure preventive of the reproduction of the ear-drum is found.

¹ *Handbuch der Ohrenheilkunde*, Band ii., p. 782.

"After the above experiences the indication (for excision, A—¶ 3 above) in the pathological changes, designated by the name of sclerosis of the tympanum (dry catarrh), must be declared as very doubtful. At any rate, cases selected in the future, according to this indication, for trial operations, should be limited to those in which the deafness has not reached such a very high stage that only loud words spoken into the ear can be understood, and in which case it has been positively proven that the hearing after catheterization has been definitely, if only temporarily, improved, or if a very noticeable effect has been gained by a trial incision of the ear-drum. For thereby is demonstrated the non-existence of ankylosis of the stirrup, which has anatomically been proven to be the most frequent termination of sclerosis."

In 1891 Stacke, a former assistant of Schwartze, published a new method of operating in chronic inflammations of the middle ear, whether existing with or without inflammation of the mastoid, or cerebral irritations. This operation is so rational that it seems remarkable no one should have thought of it before. It aims to *remove all diseased tissue found in the middle ear*, and, to accomplish this, one or all of the cavities are opened. Stacke operates from within the osseous canal, enlarging in the direction desired by removing consecutive layers of bone, until the cavities are exposed, and all diseased tissue removed. To guard against cicatricial contraction of the meatus, and to transplant healthy epithelium to the denuded cavity, he devised the very successful method of preparing flaps from the membranous canal.

I have seen the Stacke operation performed, and have also tried it, but greatly prefer the method as perfected and practiced by Schwartze.

I give below a list of *instruments*, with *accessories* and *preparations* necessary for the operation.

A good light is required—daylight preferred—but in emergency the electric forehead mirror, as made by Leiter and others, now frequently used in examinations, has served me as an excellent substitute.

Instruments.—One ear speculum and forehead mirror for inspecting the parts before operating; one metal ear syringe; a razor; one scalpel; one dozen hæmostatic forceps; a blunt-pointed periosteum scraper; one blunt four-pronged retractor, 18 *mm* wide; two Stacke knives, right and left, for cutting membranous canal; a wooden mallet; six assorted chisels, 11 *cm* long, and the cutting edge with rounded corners from 2 to 10 *mm* broad; one Stacke chisel (curved handle); two bone curettes with oval cups, one 13 by 6 *mm*, the other smaller, also one with angular handle and cup 2½ *mm* broad; two flexible probes; one paracentesis needle; a blunt-pointed knife for cutting drum membrane; right and left tenotomes and a Wilde snare; two pair of angular ear forceps, one with teeth, the other smooth, for removing splinters of bone and holding cotton or gauze pledgets; needles, catgut, and silk.

For convenience and thoroughness I have found nothing equal to the steam sterilizing apparatus,¹ as recommended by Schimmelbusch.² All coats, towels, gauze, cotton, bandages, etc., must be packed loosely in the perforated cans, which are placed within the large steam cylinder, and should remain three quarters of an hour after the thermometer registers 100° C., when they may be removed. The advantage of these cans is that they can be tightly closed and readily carried to the place of the operation, thus guarding against re-infection.

All of the instruments must be boiled from five to ten minutes in 1 per cent. soda solution. The soda is added to protect the instruments from tarnishing, and it increases the disinfecting powers of the boiling water.

The hands and forearms of the surgeon and assistants must be made as aseptic as is possible by the free use of hot water, soap, and a stiff brush, followed by a rubbing with gauze saturated with ether, and, lastly, washed in a solution of 1:1000 bichloride.

The Operation.—The patient should be bathed and furnished with a complete change of linen; special attention

¹ Manufactured by M. Lautenschläger, Berlin.

² Schimmelbusch, *Aseptische Wundbehandlung*, 1892.

must be given to the thorough cleansing of the head by the free use of soap and water. All the scalp within a radius of four inches of the ear must be shaven; if the parts are tender and patient very nervous, this may be deferred until after anæsthesia. The ear is thoroughly syringed to cleanse the canal of offensive secretions, and the convolutions and parts shaven disinfected by the free use of soap and water, ether, and 1:1000 bichloride. The scalp should be enveloped in a towel wrung out of a bichloride solution and securely fastened.

The ear is pulled gently forward and the incision begun 1 *cm* above the insertion of the auricle, and carried downwards 1 *cm* behind and parallel to the insertion of the auricle, to the apex of the mastoid. The tissues are divided to the bone by a few and as cleanly-made strokes as possible.

In rare cases when, on account of swelling of the soft parts or extensive disease of the bone, more room is wanted, make a free incision backwards at right angles (see Fig. 9).

Ligate bleeding vessels with catgut or use torsion, and stop capillary bleeding with hot water.

Denude bone with raspatory, backwards, so as to expose mastoid, and forwards into external osseous canal to a point where lining becomes membranous. Then with a Stacke knife cut through the soft parts and we now have the whole of lining of canal protruding from detached auricle like a funnel. To hold this out of the way a long angular retractor is in general use, but it frequently slips, is tiresome, and requires the entire hand of an assistant. In its place I use a loop¹ (see Fig. 1) about five inches long, which the assistant can hook with the ring and little fingers and draw the ear forward. With the other fingers of the same hand he can hold such artery forceps as are needed to control venous and capillary oozing.

The posterior lip is drawn backwards by the retractor (see Fig. 1), and we can now inspect the mastoid for path-

¹ This picture, taken from a cadaver, shows the opening as it appears after the bridge of bone has been removed and the cavities united into one. I must apologize for the incorrect position of the assistant's hands, absence of the artery forceps, and of the towel which should envelop the head, and excuse these errors on the ground of lack of accommodation and time.

ological changes, and the membrana tympani is placed within easy access and full view, by direct light.

If the cortex of the mastoid is diseased, we follow up the affected parts by the aid of curette and chisel; but should the bone be healthy, then we must look for our landmarks (see Fig. 2). Of these there are two, the *linea temporalis*, a horizontal ridge formed by the extension backwards of the zygomatic process (Fig. 2, 17); it is nearly always present

FIG. 1.

View showing the parts as they appear when the operation upon the bone is finished, and we are ready to replace the soft parts; also indicating position of retractor and *loop*.

and can be felt through the normal integuments. This line, in about eighty per cent. of cases, lies lower than the middle cerebral fossa,¹ and in the remainder, either on a level with it or higher, for which reason we must never carry our operation above this line. The other landmark is the *spina supra*

¹ On 120 skulls examined, Schülzke found the lower edge of the linea temporalis below the middle cerebral fossa in 82.5 per cent., in $3\frac{1}{2}$ per cent. at the same level, in $10\frac{1}{2}$ per cent. higher, and in $3\frac{1}{2}$ per cent. not measurable.

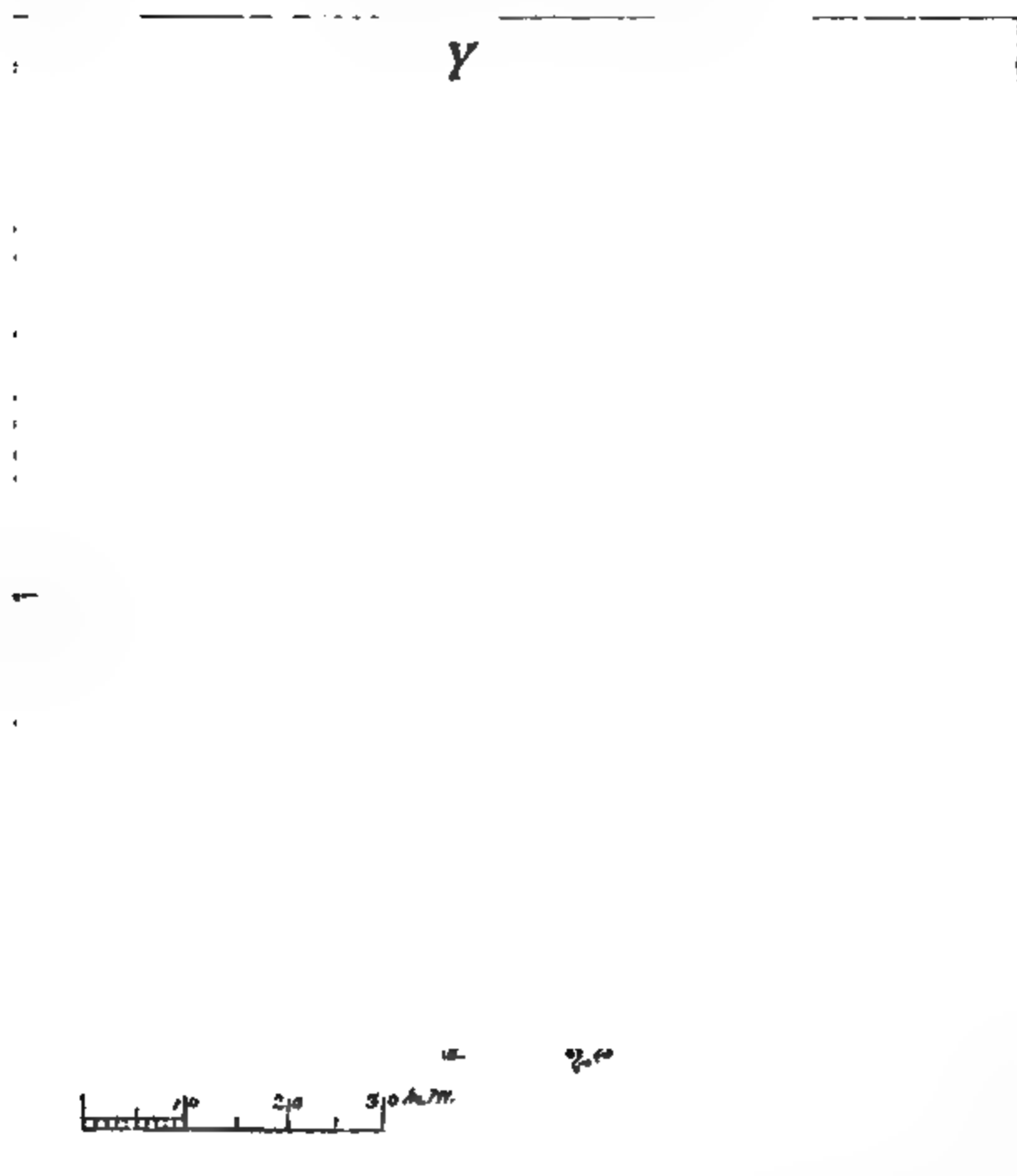
meatum (Fig. 2, 16). Bezold found after numerous measurements that the spine is higher than the floor of the antrum. Kisselbach and Schülzke found it present in about eighty per cent. of cases. Should neither of the landmarks exist, we can readily determine our starting-point by drawing horizontal and perpendicular lines tangent to the external meatus (Fig. 2, *Y Y*, and *W W*). The line *W W* corresponds to the lower edge of the *linea temporalis*, and also touches the upper edge of the meatus; line *Y Y*, is erected at right angles to this, touching the posterior margins of *spina* and external meatus.

We now construct our irregular oval (Fig. 2, *C*) 12 *mm* perpendicularly and 8 *mm* horizontally, which forms the base of a cone, the apex of which lies in the antrum.

With the largest chisel we begin to remove the bone as outlined, convert the cone into a funnel-shaped opening, the general direction of which should be inwards and slightly forwards, almost parallel with the posterior wall of the meatus, leaving the bridge of bone between the funnel and external meatus, about 1 *mm* externally and 4 *mm* near the *membrana tympani*. The upper surface of the funnel I give only a very slight downward incline, which is enough to guard against injuring the *dura*; while the posterior and lower walls are given a decided forward and upward slant, because by so doing we are less liable to wound, even if we should expose, the lateral sinus. If encountered at all it will generally be at or near the place indicated by *L S*, Fig. 2. But we may find it anywhere along the posterior wall. The great variation in the position of the lateral sinus is well shown in Figs. 3 and 4, where there is a difference of 16 *mm*. When working in this neighborhood the chisel should be large and held very obliquely, and the bone removed in very thin shavings; with these precautions there is but little danger. To demonstrate this I have repeatedly exposed the sinus upon the cadaver without wounding it (also see Case 4).

Cases of injury to the sinus have been reported by Knapp, Schwartze, Jacoby, and others. Judging by the small percentage of fatalities among cases where this accident has

FIG. 2.—SIDE VIEW OF TEMPORAL BONE.



W W, and *Y Y*, lines indicating the horizontal and perpendicular planes of the skull ; *O*, opening in mastoid leading to antrum ; *O A*, opening into antrum ; *L S*, shows where lateral sinus is generally encountered if displaced far forwards ; *M*, mastoid process ; 22, wedge formed by posterior wall of external meatus and opening in mastoid ; 15, styloid process ; *M T*, memb. tymp. ; 14, glenoid cavity ; 28, Glaserian fissure, 17, zygomatic process ; 12 and 13, outlines showing position of hammer and anvil and location of attic ; 16, *spina supra meatum* ; *A*, dotted lines showing position of antrum, varying much in different subjects ; *E*, linea temporalis.

occurred, the injury *per se* is not as dangerous as was formerly supposed,—due perhaps to the non-infection of the wound under modern asepsis.

I once saw this injury in Schwartz's clinic; the bleeding is very profuse, but readily controlled by iodoform tampons, and the operation is, of course, brought to an abrupt termination. The patient must be kept quiet for several days, and in about two weeks the operation can be completed.

After penetrating the cortex, some of the upper cells leading to the mastoid process are generally opened, which gives us an opportunity to judge of the presence or absence of disease in this part. If diseased, we chisel away the cortex from over the area affected—if need be the whole plate—and with a sharp spoon remove affected parts. Should we find the cells normal, we proceed to complete our tunnel, keeping steadily along the posterior wall of the external meatus and exchanging the broad for the narrower chisels.

The depth at which we encounter the irregularly-shaped cavity called the antrum¹ varies greatly (*, Figs. 2 and 6). This is explained by the variation of size found in health, which is aggravated by pathological changes; the bone may *decrease* in thickness on account of cholesteatomatous formations and caries, or it may *increase*, *i. e.*, osteosclerosis result as a condition secondary to long-existing suppurations. After entering the pneumatic cells, an olive-pointed probe should be frequently introduced to determine when we have reached the antrum. The average depth at which this occurs in adults is, according to Bezold, 6 *mm*, according to Schwartz, 12 to 18 *mm*,—a bewildering discrepancy, which can only be explained by the great variation in the mastoid, as mentioned above. It shows, however, how important it is that all writers should take their measurements from *one point*, and the most constant and least liable to variation from disease is the *spina supra meatum* (Fig. 2, 16).

Schwartz in his recent work (vol. ii., p. 804) states that in exceptional cases the chisel may “already” reach the

¹ The average size, as given by Professor Bezold, is length 12.7 *mm*; height, 8.5 *mm*; and greatest width, 6.7 *mm*.

FIG. 3.

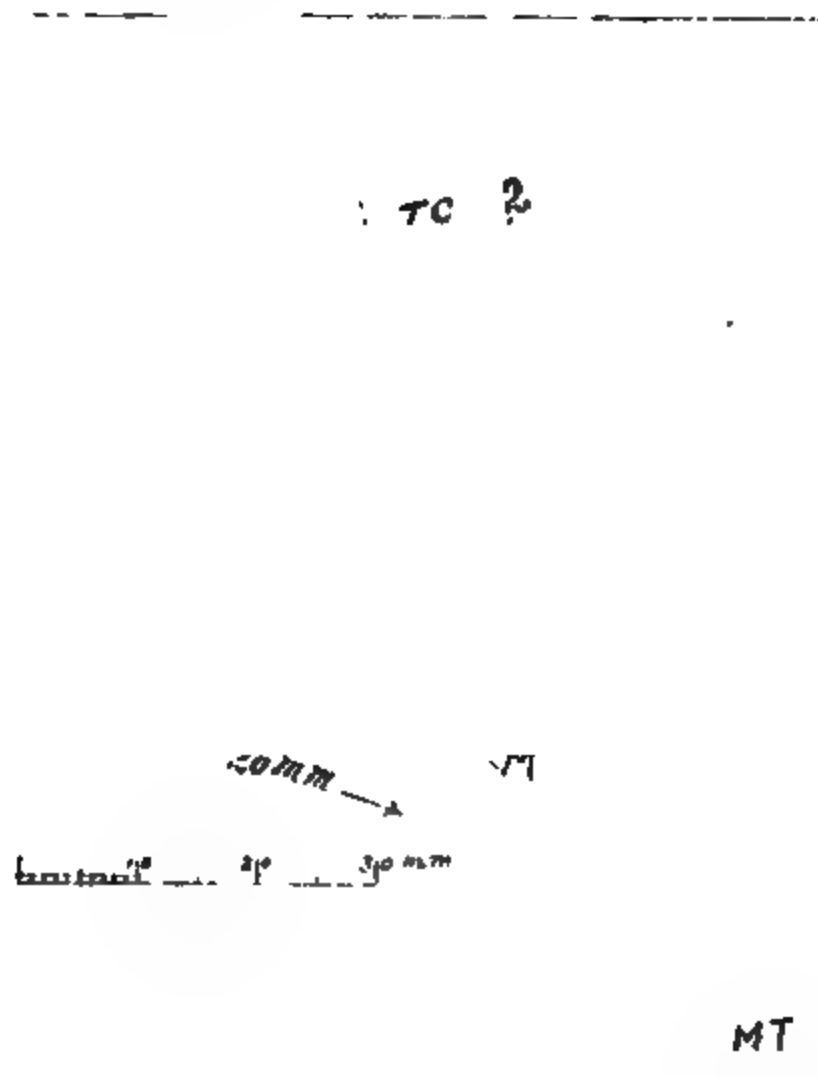


FIG. 4.

LS



FIG. 3.—Horizontal section through right temporal bone, showing distance between lateral sinus and external canal. Cut begins below centre of external canal, passing obliquely upwards and inwards.

L S, lateral sinus; *M*, mastoid; *N*, facial nerve; *T C*, tympanic cavity; 2, vestibule; *M T*, memb. tymp.; *C*, external canal; small arrow indicates the point where a perpendicular line from the *spina supra meatum* would touch.

FIG. 4.—Horizontal section through right temporal bone, cut near centre of external meatus, showing how close lateral sinus may come to external canal in some cases.

a, internal carotid artery; *I*, internal jugular vein. For explanation of other letters, see Fig. 3.

facial canal at a depth of 18 *mm*; at a depth of 20 *mm* we should exercise the greatest precaution; and we should never go beyond 25 *mm*.

That such measurements have not been taken from the spina, but from the changeable prominent portion of the mastoid, as is indicated by dotted lines (Fig. 5, 23), and hence are *valueless*, is easily proven by examining Fig. 5,¹ where the position of the spina is indicated by an arrow; this point in our section is the outer edge of the wedge of bone (22) which is left between the posterior wall of canal (C) and our funnel-shaped opening.

The distances (which vary only slightly in different specimens when cut through the same plane as Fig. 5) from the spina to the parts likely to be injured, are as follows:

From spina to facial nerve	. . . . .	15 <i>mm</i> .
“ “ horizontal semicircular canal	. . . . .	16 <i>mm</i> .
“ “ posterior “ “	. . . . .	18 <i>mm</i> .
“ “ foot plate of stapes	. . . . .	22 <i>mm</i> .
“ “ end of short process of anvil	. . . . .	16 <i>mm</i> .

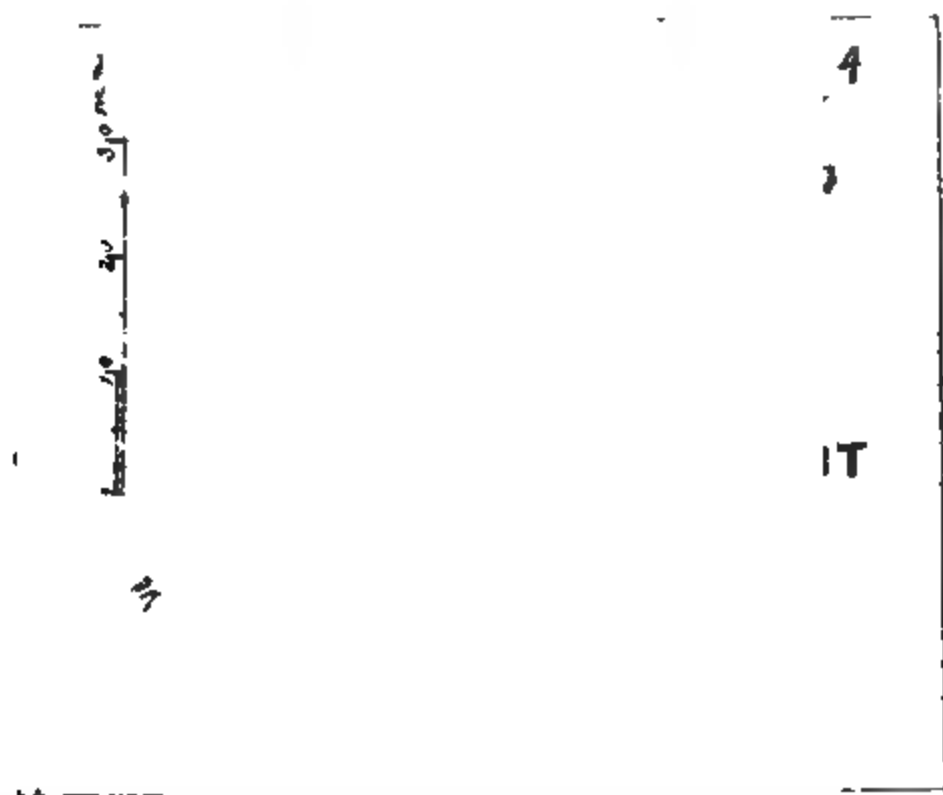
It will be seen from these measurements that 20 *mm* from the spina would carry us into the labyrinth, and 25 *mm* beyond it. *And it may be accepted as a general rule that the only safe guide to the extreme distance which we may penetrate is the distance from the spina to the posterior superior margin of the drum membrane, which, in health, fluctuates but little from 15 mm.*

The direction of our canal should be such that the wedge of bone (Figs. 2 and 5, 22) should be 4 or 5 *mm* thick at the memb. tymp., and the floor inclined upwards, as shown by the dotted lines (Fig. 6, O), opening into the neck of the antrum, and close to the extremity of the processus brevis of the anvil. (See position of anvil and artificial opening into antrum, partly occupied by end of arrow—Fig. 6.)

¹ During the preparation of this article I dissected carefully 15 temporal bones, and selected for the illustrations such as would best demonstrate the points I desired to explain. The drawings were prepared after numerous careful measurements, and are exact full-sized reproductions of the specimens.

We are not often compelled to carry the opening so deep, and it will be noticed in Fig. 6 that the antrum (*) passes outwards and backwards from the attic, anterior to an antero-posterior line, touching the memb. tymp., frequently coming within a few *mm* of the surface, and were it not for the danger of encountering the lateral sinus, we could, in

FIG. 5.



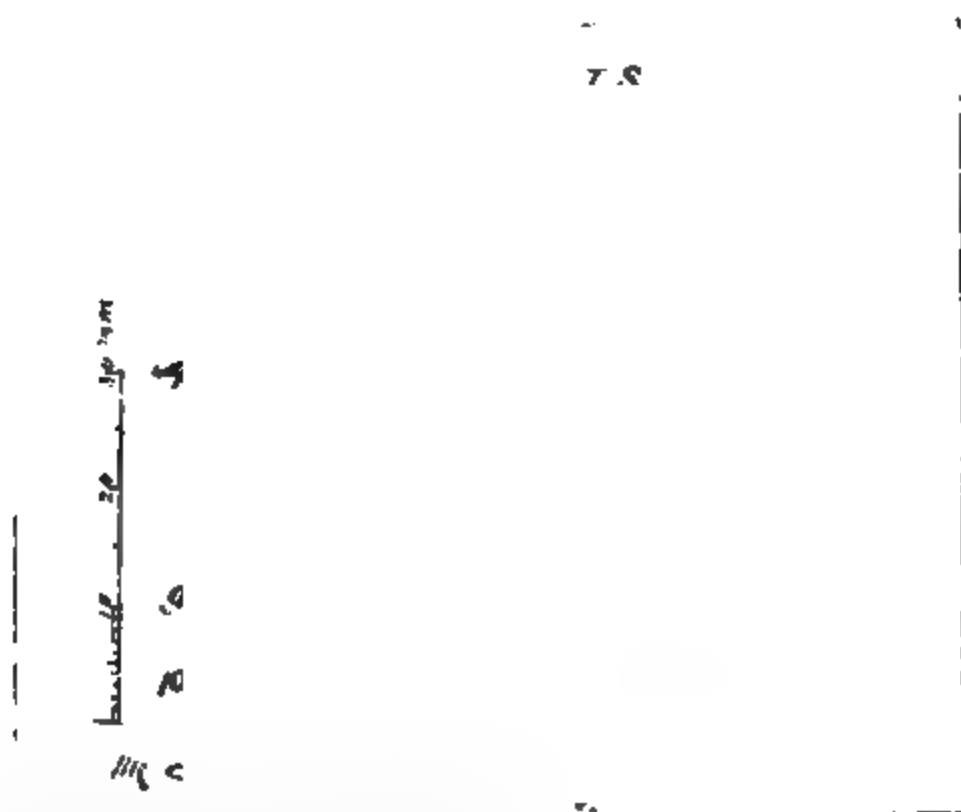
Horizontal section through right temporal bone, cut 2 *mm* above centre of external canal. *O*, opening in mastoid leading to antrum, the heavily dotted lines indicate the depth to which the opening penetrated in the upper section of this bone; small arrow indicates relative position of *spina*; *22*, wedge between opening in mastoid and external meatus, *M*, mastoid; *23*, dotted lines indicating how osteosclerosis may increase the depth to which it is necessary to penetrate, *C*, external canal, *, large cell in direct communication with the floor of antrum above; *L S*, lateral sinus; *Z*, posterior semicircular canal, *N*, facial nerve; *X*, horizontal semicircular canal; *2*, vestibule; *1*, internal canal; *3*, cochlea; *4*, fenestra ovalis; *10*, Eustachian canal; *M T*, memb. tymp.

most cases, reach it much more quickly by directing our opening inward, backward, and upward, instead of inward slightly forward, and upward.

Having opened the antrum, we can, with a small probe, bent at an obtuse angle of about 7 *mm* from the point,

enter the *attic*,¹ the probe generally passing over the short process, and behind the body of anvil and head of hammer (Fig. 2, 12-13) in the direction indicated by, but lower than the head of arrow (Fig. 6).

FIG. 6.



Perpendicular section through right temporal bone, beginning at line *BB*, behind opening *O*, in mastoid (see Fig. 2), and directed inwards and forwards, cutting Eustachian tube in its long axis.

N, dotted lines show the course of facial and chorda tympani nerves; *M*, mastoid; *Ch.*, chorda tympani nerve; *MT*, memb. tymp.; *A*, canal for internal carotid; *E*, Eustachian tube; *p*, processus cochleariformis; *At*, Attic; 7 and 8, showing defects in the bone covering attic and antrum; *OA*, opening into antrum (see Fig. 2); *L.S.*, lateral sinus; *, antrum; *O*, dotted lines indicating funnel-shaped opening (see *O*, Fig. 2).

If the attic is roomy the probe may be passed across it into the tympanic cavity.

(In *acute* cases where it is *not desired* to remove the ossi-

¹ The *attic* is that space located above the tympanum, within which are contained the body and short process of the anvil, and the head and neck of the hammer. The floor of this cavity is about indicated by the course of the chorda tympani nerve (Fig. 6, *Ch.*). This cavity has received various names: (1) *atticus*, (2) *upper tympanic cavity*, (3) *recessus epitympanicus*, (4) *aditus ad antrum*, the latter being frequently contracted to (5) *aditus*.

Bezold gives the average size of this irregular space as follows: Length, 4.2; height, 5.7; and greatest width, 6.6 mm.

cles, it is well to remember that a stiff probe roughly pushed into the attic may dislocate them, as I have demonstrated on the cadaver.)

The probe which has been passed into the attic is left as a guide, the extremity being bent backward towards the occiput, and held by an assistant.

We now begin to cut away the wedge (Figs. 2 and 5, 22), exerting great precaution when removing the last portion, which forms part of the outer wall and floor of the attic, including a segment of the annulus tympanicus, as it generally gives way very suddenly, and the chisel might plunge across the cavity and injure the facial canal or the stapes. It is also safer to use one of the broader chisels, this being less liable to slip than a narrow one.

The anvil is now exposed, disarticulated from the stirrup with a Schwartze tenotome, and removed with a pair of forceps. I have removed the anvil several times without cutting the articulation, which parted readily, not disturbing the stapes. I should not, however, recommend it as a routine practice. While in many instances the long process is necrosed, and there is no articulation, in others it is unimpaired or firmer than normal on account of inflammatory changes; and the accidental removal of the stirrup, which although it has frequently occurred, even in suppurative cases, without any ill effects beyond greater impairment of hearing, is unpleasant and not clean surgery.

We next detach the memb. tymp. from the annulus tympanicus with the membrane knife, and then remove the hammer. The upper part of the osseous canal (pars ossea) is cut away until a bent probe passed to the roof of attic and drawn outwards fails to meet any obstruction. The antrum, attic, tympanum, and external meatus are now united into one large cavity, all parts of which can be freely inspected, even to the entrance to the Eustachian tube (Fig. 6, 10). We next endeavor to remove diseased tissue wherever found, by chisels and curettes. We may find carious bone in any of the cavities, which if possible must be removed, even if we are compelled to freely expose the dura or lateral sinus; but we should never be aggressive unless we have the hidden

anatomical relations of the parts *clearly* before our mind's eye. In the tympanic cavity proper we must at all times exercise the utmost care in the use of curettes; the reason for this will be self-evident if we glance at Fig. 7, where the anterior and a part of the medial walls are composed of bone, in places not thicker than two sheets of the paper on which this article is printed. We should also be on our

FIG. 7.

Horizontal Section of Temporal Bone Cut Near Floor of External Meatus, *A*, canal for internal carotid; *TC*, tympanic cavity; *MT*, membr. tymp.; *V*, bulbus of internal jugular vein; *N*, facial nerve; *LS*, lateral sinus; *M*, mastoid.

guard against injuring the facial nerve which at times has scarcely any bony covering. In using the curette in the attic, it is also well to remember that often the tegmen tympani is exceedingly thin, and even cribriform, as shown at 7 and 8, Fig. 6.

Anteriorly we could readily wound the internal carotid, for while in most cases there is a firm wall, as shown in Fig.

4, between tympanum (*TC*) and internal carotid (*A*) and the bulb of the internal jugular vein (*V*), we never know whether or not we are operating on a case where the walls are as thin or even thinner than in Fig. 7. Friedlowsky and Zuckerkandl¹ found cases where the walls were *cribriform* or *entirely absent*. The bulb of the internal jugular vein (which is cut at *V*, Fig. 7) is formed by the coalescence of the lateral and inferior petrosal sinuses. The size of the jugular bulb or sinus varies much—if large it may form the floor and medial wall of tympanum; the bone is then either very thin, as in Fig. 7, or entirely absent. Müller² found in 100 specimens examined, the wall transparent in 15, and defective in 13. Cases of fatal bleeding from the jugular are also quoted by Hessler.

All sharp ridges, corners, and spiculæ of bone, both within the cavity and around the outer margins, must be rounded off.

Where the wedge (Figs. 2 and 5, 22) was removed there still remains a ridge between the external canal (Fig. 5, *C*) and antrum (Fig. 5, *), which increases in height as it approaches the middle ear. We can with safety obliterate this ridge up to within 10 *mm* of the annulus tympanicus, measured along the lower and posterior portion of canal; beyond this part (medialwards) we encounter a dense, rounded ridge of bone curving forward over the oval window, and forming a part of the floor of the attic. This ridge, throughout its course, encloses the facial nerve, and within the part curving over the window is also harbored the horizontal semicircular canal, which must, of course, not be injured.

Concerning this Stacke³ says:

"It is essential that the communication between the antrum and external canal be as broad as possible, for reasons which the after-treatment has proven. So much of the pos-

¹ Hessler, "Die letalen Folgeerkrankungen bei Ohraffectionen," *Handbuch der Ohrenheilkunde*, Band II.

² Hessler, "Die letalen Folgeerkrankungen bei Ohraffectionen," *Handbuch der Ohrenheilkunde*, Band II.

³ "Weitere Mittheilungen über die operative Freilegung der Mittelohrräume nach Ablösung der Ohrmuschel," *Berliner klin. Wochenschrift*, 1892, No. 4.

terior wall of the external canal can be removed laterally, that the lower wall of the external canal can pass uninterruptedly into the lower wall of the attic. Deep in, however, there still remains below a ridge between canal and antrum; and on a level with the aditus the width of the cleft is regulated by this ridge of bone. Should we *at this point* attempt to *widen the attic downward*, [italics are mine] injury of the facial would be unavoidable."

Schwartz, in his latest work,¹ repeatedly calls attention to the liability to wound the facial nerve and says:

"During the earlier months in which we operated according to this method there occurred six cases of transitory facial paralysis, later none. The nearer we come to the antrum in chiselling away the wall of the posterior canal, the more careful we must naturally be. At any rate, it is possible to wound the nerve without having touched the medial wall of the exposed cavities, even farther laterally in the descending portion of the Fallopian canal in the mastoid proper. Here one may come upon very marked individual variations of the course, and we have come into collision with the canal where under normal conditions we should not suspect finding it."

From these statements it is evident that much care should be exercised to guard against wounding the facial canal.

In the very excellently compiled little work entitled *The Mastoid Operation*, by S. E. Allen, the author ventures a criticism of Stacke, which gives the impression that Stacke's precautions when approaching the facial canal are too exacting.

Allen states:

"We are thus enabled, although contrary to what Stacke says, to remove a considerable portion of this ridge medially, and can render the opening between antrum and meatus almost as free as we can more laterally.

"The essential point in the operation is to make the antrum and attic accessible from the meatus, and therefore it is of the greatest importance to cut down the ridge as much as possible."

¹ *Handbuch der Ohrenheilkunde*, Band II., S. 825, 1893.

By referring back to the translation of Stacke, it will be seen that he virtually advises what Allen attempts to criticise, so far as removing the ridge between external canal and antrum is concerned. What Stacke specially wishes to emphasize is where he says: "Should we at this point attempt to *widen the attic downwards*, [italics mine] injury of the facial would be unavoidable." In other words, it would be dangerous at this point to attempt to widen the passage by chiselling away a portion of the aquæductus Fallopii, a statement so self-evident that dispute is out of the question. Besides, I see no occasion for running risks of injuring such important parts, for I have not found any difficulty in obtaining sufficient room for inspection and treatment of antrum and attic, when all of the posterior and a portion of upper wall of external canal (pars ossea) has been removed.¹

The only nerve that is unavoidably injured is the chorda tympani, but with no consequential results excepting temporary inability to taste on the corresponding side.

The operation upon the cavities being finished we proceed to cover the denuded bone as far as possible with two flaps formed from the funnel-shaped lining of external canal, in the following manner: The funnel is split on its upper posterior surface, in the direction of its axis, up to the concha, where another incision is made at right angles, cutting through one half of the diameter of the funnel; this forms two flaps, which are turned back over the denuded bone. To help hold them in position we insert catgut sutures into the edge of each flap and sew it into the upper and lower margins of the wound. The object of the flaps is to guard against cicatricial contraction of the meatus, and also to bring healthy epithelium into the middle ear. Especially do we hope much from this in cholesteatoma, because the healthy epithelium from the implanted flaps spreads very rapidly and covers the whole cavity if the granulations are properly controlled, and no diseased tissue is left behind.

In cases where there has been much discharge I syringe

¹ If the drawing of Plate VI. (Allen's book) is correct he has removed even less of the ridge between antrum and external canal than Stacke recommends.

the parts with a hot neutral salt solution ; in others I only cleanse the cavity thoroughly with pledgets of gauze or cotton.

When the disease is limited to the ossicles and mucous membrane I generally close the posterior wound entirely with silk sutures (see Fig. 8).

FIG. 8.

Showing appearance after removal of first dressing in cases where the wound was closed entirely after the operation. Irregularities along line of union caused by suppuration and scar following a former mastoid operation (see Case 12).

I have not as yet determined to my own satisfaction where to draw the line as to the cases in which it is best to sew up the wound at the time of the operation and pack the cavity through the external canal or only close

the upper and lower part of the incision (see Fig. 9) and pack, both through the posterior opening and external canal; the latter must not be neglected to guard against constriction of meatus.

FIG. 9.

Case 12, showing appearance after removal of first dressing in cases where the wound is left open after the operation. The white elevation on anterior lower margin of opening is a wad of cotton passed through external canal.

I use iodoform gauze for packing, and so far have not encountered any of the unpleasant symptoms, such as nausea, vomiting, and eczema, of which Schwartz speaks in his latest publication.

The ear is covered with gauze or cotton, and carefully

bandaged, and the patient is kept quiet for three days, when the first dressing is removed.

The opening behind the ear is generally permitted to close between the fourth and sixth weeks, when the appearance generally is as in Fig 10, unless there has been extensive loss of bone from caries.

Fig. 10.

Showing appearance of a case after the parts have been permitted to close.

REPORT OF CASES.

In preparing this paper I have excluded all of my operative cases on the ear where the ossicles were not removed, nor have I included any of the cases upon which I operated while in Professor Schwartz's Clinic in Halle. This operation is still new, and the number of reported cases is not sufficiently large to render additional reports valueless.

How long a time must elapse after the patient is discharged, before we are justified in claiming that a cure has been effected, must naturally vary according to the character and extent of the pathological changes found. By the ordinary extraction of the ossicles through the external canal, without opening directly into the adjacent cavities, various operators maintain that from six months to one year must elapse before one can lay claim to a cure. Schwartze, whose opinions on matters relating to operations on the ear we must acknowledge as far outweighing the views of any other individual authority, claims that two years must elapse from the time the patient is discharged before we can pronounce a cure. He also states that in mastoid cases operated upon by himself from twelve to thirty years ago, the disease returned in some cases from three to eight years after they had been discharged as cured. I do not think that cases operated upon by the old operation and before the aseptic wound treatment had been introduced should be classified with those operated upon by the Modern Method. If a case has been free from any evidence of inflammation for one year it seems one should be justified in claiming a cure. Especially as by the present method of operating, the cavities are opened to direct inspection, whereas by the old method the disease was frequently overlooked in the unopened cavities and remained dormant until some irritation, such as exposure to inclement weather, changes of the seasons, declining health, etc., brought it into activity again. I see no reason why an operation upon any part of the body should be a guaranty that disease should never return in this particular region, for even if there is no trace of the primary disease after an operation, the nutrition of the part has been altered to some extent by changing the normal anatomical relations, and the resulting cicatricial tissue formation and enervation make the operated part in a greater or less degree, according to its location in the body, a *locus minoris resistentiæ* during the remainder of the patient's life. Even with the modern operation we shall have returns of cholesteatoma in some cases, because it is not always possible to remove every epithelial nest.

But with tympanum, attic, antrum, and, if found necessary, the mastoid cells, made into one cavity, which can be easily inspected through the external meatus, any new formation can be readily removed with a curette, and consequently the patient need never suffer any serious inconvenience beyond an occasional inspection and removal of any epithelial masses, just as we are at irregular intervals called upon to remove accumulated cerumen from the external canal. This, of course, applies only to cases where the disease is limited to the middle ear, and not where the cholesteatoma extends to the internal ear—a condition which fortunately seldom occurs.

The question, how shall we determine when to perform simple excision of the ossicles through the normal external canal, and when to make the radical operation, is not always an easy one, as will be seen by reading rule 5, under the heading of "Indications for Opening the Mastoid"; also "Indications for Excision of the Ossicles." (a) Rules 1 and 2. (See translations above from rules laid down by Schwartze.)

So far, we know of no positive signs or symptoms by which we can determine when the disease is limited to the ossicles, and when it is limited to one or more of the cavities within the middle ear, with or without caries of the ossicles.

But we are beginning to learn from experience that the ossicles are in the majority of cases *secondarily* affected, and, as a result, simple excision will be made *relatively less*, and the radical operation *more* frequently.

While it is true that removal of the ossicles facilitates the cure of diseased parts in the cavities, because permitting a more ready application of medicines, yet the thorough exposure and removal of all affected parts at once by surgical means, under strict aseptic precautions, *as is practised in other portions of the body under similar conditions*, is far more scientific than to submit the patient to the tedious process of waiting for nature to cast off the necrosed tissue.

In the hands of a *qualified operator*, the danger incurred by the operation *per se* is very small. Of one hundred cases

operated upon by Schwartz,¹ five per cent. died—one of uræmia, one of chronic abscess of the brain, two of meningitis, and one of sinus-phlebitis with pyæmia. It will be seen that these were almost all cases where the fatal disease probably existed at the time of the operation, and they were in all probability little, if at all, aggravated by the surgical interference. So that in cases where the inflammation has not extended to the vital parts, or where no serious disease exists, such as uræmia, diabetes, etc., in an advanced stage, the fatality is so nearly *nil* that there should be no hesitancy to operate.

The literature is full of reported cases where the usual medications *appeared* to have cured without operative interference; but if watched long enough we shall find that, except in a very small percentage, the discharge recurs.

I do not wish to be understood as being opposed to careful treatment by the ordinary methods; but if with thorough treatment we fail to arrest the difficulty within a reasonable time *we should operate*. Furthermore, if at the very beginning we find evidence of necrosis, the operation should not be delayed.

Case No. 5 illustrates this perfectly. To all appearances she was perfectly cured for six months, when suddenly the inflammation was lighted up anew, and an operation proved that she had been suffering from necrosis of the bone, and the formation of a large cholesteatoma; the beginning of these pathological changes evidently dating back several years.

CASE 1.—Isaac Quaw, æt. twenty. Right ear had been discharging more or less constantly during the past six years. Six weeks ago pain became intense, and discharge very profuse and offensive. Dizziness and headache were frequent. Above ear and mastoid the parts were swollen, but not very tender. Pressure over this region caused pus to ooze from the external canal, the latter being swollen and much inflamed so that it was impossible to obtain a view of the memb. tym. Heard watch on firm contact, loud conversational tones close to the ear.

¹ *Handbuch der Ohrenheilkunde*, Band II., S. 823.

Operation, March 11, 1892.—Usual incision was made behind auricle, evacuating about 4 oz. of pus. Upper portion of canal and mastoid denuded, but not discolored. The remnant of memb. tymp. was covered with granulations. Removal of these revealed the fact that they protruded through openings in Shrapnell's membrane and the posterior segment of drum-head. Hammer and anvil removed, caries on long process of anvil and head of hammer; attic filled with granulation tissue, which was thoroughly curetted; pus in antrum. No caries of walls found.

Wound behind auricle closed completely by superficial sutures. Dressing and sutures were removed on the third day, and union by first intention found. At no time after the operation did patient have any elevation of temperature. Was discharged in six weeks.

On *April 24, 1893* patient was sent for and examined. Ear was unchanged. Line of incision behind auricle was of a pale red color, and there was some tendency to keloid formation. External canal was free and healthy, admitting of free inspection. Hearing distance, watch $\frac{1}{8}$, whisper tones 10 ft.

CASE 2.—Robert Gurlock, 46 years of age. Was admitted to the Cincinnati Hospital, Jan. 4, 1892, suffering from chronic otitis media purulenta. Gave history of repeated attacks of pain and discharge from the left ear, since in the German army during the war of 1870. Had complete facial paralysis on the left side, this having developed about five weeks previously. Patient complained bitterly of intense noises in the left side of head. There was a thin yellowish offensive discharge from the left ear. There was no tenderness over mastoid, nor external evidence of inflammation.

Operation, Jan. 29th.—Bone over mastoid appeared healthy; a small button was removed from the mastoid and cells found normal. Attic and antrum filled with granulations; hammer removed, neck carious; anvil could not be found. Cavities curetted and promontory carefully examined for denuded bone, but none could be detected.

Posterior wound closed by sutures and ear dressed as usual. Stitches removed on the third day. Union by first intention. No fever.

Feb. 25th.—Cavity rapidly becoming covered with healthy epithelium, but facial paralysis was still complete. Patient left contrary to advice.

March 1, 1893.—Patient again examined in hospital where he was recently admitted on account of another disease. Ear dry, but facial paralysis was still present.

CASE 3.—Mrs. John Curran, age fifty-two; well developed and nourished. Gave history of deafness and discharge from both ears at irregular intervals, dating back many years. Discharge more profuse during the last few months. Was first examined April 10, 1892. In this history only the left ear is considered, being the one upon which the operation was performed.

Status Prasens.—Profuse discharge of yellow offensive pus. There is a small circular perforation anterior to the handle of malleus; ear readily inflated; large bubbling râles heard through diagnostic tube. There is no swelling or redness about the ear, but pressure over the mastoid elicits tenderness. Cannot hear watch on contact, and only very loud voice indistinctly when spoken into the ear.

Patient objected to operative interference, so the case was treated daily by the usual methods from April to September without any visible improvement. She now began to suffer from severe pain in the head and dizziness. Convergent strabismus of the left eye also developed, but no evidence of optic neuritis. A few days later she developed fever, redness and pain over mastoid, and then readily consented to an operation.

Sept. 27, 1892.—Patient entered private ward in Good Samaritan Hospital and was operated the same day. Ether narcosis. The usual incision through tissues more than one inch in thickness, requiring an incision backwards at right angles to the first, in order to expose mastoid. There was free hemorrhage from the dark-colored swollen tissue. The bony plate over the mastoid was extensively necrosed, of a dark, greenish-black color, and perforated at two points. Antrum filled with pus and granulations. The trabeculae of mastoid dark-colored and broken down. All of mastoid removed, excepting the outer shell at apex. At the angle of lateral sinus the dura was exposed over an area $\frac{1}{2}$ inch in diameter. Posterior wall of osseous canal removed, also the anvil and hammer, with the enormously thickened memb. tymp. Middle ear and attic filled with pus and granulations, and in several places the probe touched denuded bone. Hammer was found to be normal. Anvil exhibited beginning erosion of body. Duration of operation one hour and fifteen minutes.

On the second day the temperature rose from normal to 100°.

For four days she had not had movement of bowels, and free evacuation of the latter was followed by cessation of the fever which did not return again. The loss of bone behind the auricle was so extensive that the case healed with an opening at this point. Patient was discharged January 23, 1893. Duration of treatment, four months.

July 5, 1893.—Two months after being discharged, she returned on account of a slight discharge of foul-smelling pus, through the defect left behind auricle. I found a small fistulous tract leading upward and inward; a probe came upon a very small area of carious bone. Every other portion of the united cavities normal. The necrosed area I curetted repeatedly, the last time exposing the dura over an area 3 mm in diam., the immediate effect being dizziness and unsteady gait of about 15 minutes' duration. Fortunately the opening left after the operation enabled me to *locate* and *see* the affected part. The pulsations communicated to the dura can be seen in the defective area which is slowly becoming smaller.

CASE 4.—Galen Perrin, age fourteen; well developed and nourished. First came under observation in August, 1891.

Right Ear.—Chronic purulent otitis media, which developed 10 years before during an attack of scarlet fever. Has been under treatment off and on ever since, most of the time in charge of very excellent men, yet the disease was never entirely controlled. There was no external evidence of inflammation or tenderness about the ear or over the mastoid. Memb. tymp. was entirely destroyed, excepting a narrow crescent upwards, about $\frac{1}{8}$ in. in its widest portion. There was no sign of the handle of malleus. Tympanum filled with granulations. A bent probe could be passed behind the remnant of the membrane, up into the attic, a distance of about $\frac{1}{4}$ in. without causing pain; but the cotton invariably would be covered with thick, offensive pus. Patient also suffered from hypertrophic nasal and pharyngeal catarrh. This was treated by galvanic cautery and local applications, combined with internal medication. Ear also received treatment two or three times a week at the office, in addition to daily treatment at home. By December the nose and throat were in good condition, and the visible granulations had disappeared from the tympanic cavity; but discharge continued to come from above, notwithstanding irrigation and treatment of the attic. Treatment was continued irregularly from December, 1891, until

October, 1892. Several times the case appeared to be entirely cured, but as often there would be a return of pus, finding its way down from the attic.

Patient was admitted to private ward of the Presbyterian Hospital, October 12, 1892. Anæsthetic, chloroform. In the beginning of the operation the lateral sinus was exposed, but not injured. This case belonged to that class where the lateral sinus is displaced far forwards, leaving but little room between the posterior wall and the vessel. Granulations and thick pus found in antrum and attic. Posterior wall of the osseus canal chiselled away. Anvil removed and found normal. Hammer and rest of memb. tym. removed. The entire handle of the hammer was lost through necrosis; neck and head partly eroded. Temperature never went above $99\frac{1}{2}^{\circ}$. Was permitted to get up on the third day. Exuberant granulations controlled by the nitrate of silver stick, and on two or three occasions by packing the cavity with powdered alum. In three weeks wound behind ear was permitted to close.

Dec. 28, 1892.—All of cavity covered with healthy epithelium and case discharged. Duration of treatment, ten weeks. Could hear ordinary conversational tones with the operated ear at a distance of twelve feet.

May 10, 1893.—Ear remained dry, and hearing same as when patient was discharged.

CASE 5.—Emma Pfeiffer, age eighteen. Came under treatment in May, 1892. Patient gave history of frequent attacks of pain and discharge from both ears during childhood. On the left side this had continued at irregular intervals till the present time. The discharge was not very profuse, but fetid, and a large polypus filled the auditory canal. This was snared, and pedicle appeared to spring from the attic, passing out through an opening in Shrapnell's membrane. There was no external evidence of any inflammatory process, and but slight tenderness over mastoid. There was, in addition to opening in membrana flaccida, extensive alteration and retraction of memb. tym., with large perforation in posterior segment. After three weeks' treatment discharge had ceased, and the case appeared to be well. This deceptive condition continued for nearly *six months*, when she returned on account of severe pain radiating from the ear over the left side of head. Discharge slight and fetid. She had recently suffered much from dizziness, at times so severe that she had been obliged

to lie down. Through perforation in Shrapnell's membrane, a grayish mass presented, strongly resembling a cholesteatoma; but patient had become so sensitive to manipulation that a thorough examination was impossible.

Admitted to private ward in Presbyterian Hospital, Nov. 28, 1892. Chloroform. A probe passed readily upwards into attic through the perforation in the membrana flaccida. Bone over mastoid appeared healthy; outer plate rather thick. Antrum was filled with granulations and a slight amount of thick pus. Probe readily passed from antrum to attic. The posterior wall of external auditory canal was removed, and then for the first time did the true character of the case become positively established. The attic and a large space inward and upward which had been eroded by the formation was filled with cholesteatomatous masses. The anvil did not exist, and of the hammer only the handle and a small portion of the neck remained, which, with the remnant of the memb. tymp., were removed, and all the parts thoroughly curetted. Lacunæ, or nests of cholesteatomatous masses in bone, carefully searched for and removed with chisel and curette. Mastoid cells not involved. The stapes could readily be seen and an oscillating movement communicated to it with a probe. A noticeable feature in this case was the marked and persistent fixation of the eyes to the left for about two hours after she became conscious. With a strong effort she could move the eyes past the median line toward the right, but only for a moment, when they would return to the extreme position toward the left. There was much retching and efforts at vomiting; complained of intense noises on the left side of head, which gradually disappeared. Patient left hospital on the tenth day, and came daily to the office for treatment.

Dec. 27th.—The new granulations covering denuded bone in attic having become too exuberant, were curetted and cauterized with fused argentine bead. The following day there was slight paresis of left side of face, which on the 29th became complete, lasting about two weeks, when it had entirely disappeared again. The granulations were rather persistent in this case, but packing ear with powdered alum soon reduced them. Seven weeks after the operation, opening behind the ear was encouraged to close by packing cavity through external canal only.

Feb. 22, 1893.—All of cavity absolutely dry and covered with epithelium, and case discharged. Duration of treatment, eleven weeks.

June 4, 1893.—Patient was sent for and re-examined. Ear in same condition as when patient was discharged. So far there had not been the slightest evidence of any return of the cholesteatoma. Hears ordinary, distinct and slowly spoken conversation at twelve feet with operated ear.

CASE 6.—Ambrose Welsh, age four ; scrofulous type. History prior to entering hospital not obtained. Admitted May 3, 1892. Ear treated daily, but without arresting discharge. When I went on duty in September, found profuse discharge from ear of fetid pus through large perforation in posterior portion of membrane. External canal inflamed ; memb. tym. of a dark red color. Tympanum filled with granulations and pus ; auricular glands enlarged. Mastoid not swollen, but tender upon pressure. Pharynx filled with adenoid vegetations, which I removed. Treatment of ear continued, but without improvement.

Operation, Oct. 7, 1892.—Chloroform narcosis. Increased vascularity of the bone. Antrum filled with greenish pus and granulations. Removed posterior wall. Hammer normal. Long process and body of anvil necrosed. Attic and middle ear filled with granulations. All parts curetted thoroughly.

Temperature rose to $100\frac{1}{2}^{\circ}$ in the evening following operation. Dropped to normal during the night, and remained so until the fourth day, when the wound was redressed, the temperature rising to 103° within two hours after the dressing, but soon falling again to normal. This rapid rise and fall of temperature occurred after a number of succeeding dressings, and then gradually ceased. Wound behind auricle allowed to close in the fourth week. In ten weeks cavity was perfectly dry and covered with healthy epithelium. On account of patient's youth a satisfactory hearing test could not be obtained, but closing the other ear as well as could be done by bandage, etc., child heard ordinary conversation when addressed to him.

CASE 7.—Ambrose Norwood, aged two years ; fairly well developed and nourished. Admitted to Cincinnati Hospital June 14, 1892, on account of purulent discharge from both ears and nose. History of case prior to entering hospital not obtained. Patient was treated by means of syringing, local and internal medication. When I went on duty in September, found the following condition :

Left Ear.—Post-auricular gland enlarged ; no discoloration or swelling of mastoid, but pressure upon same caused pain. There was free discharge of pus from the external canal. Through large

perforation in memb. tymp. exuberant granulations protruded which bled profusely when touched with the probe.

Right Ear.—Perforation of memb. tymp. in the anterior quadrant ; membrane but slightly injected, and the discharge moderate.

Unable to obtain satisfactory hearing test on account of patient's youthfulness. Pharynx filled with adenoid vegetations. These were promptly removed under chloroform.

After removal of vegetations, the local treatment being continued, the right ear ceased to discharge, and nasal respiration was re-established ; but the left ear was not improved, and patient was operated upon December 14th. Chloroform narcosis. Bone over mastoid appeared normal ; antrum filled with pus and the inflammation extended into the mastoid cells. Posterior osseous wall removed. Hammer and anvil removed with remains of the much thickened memb. tymp. *Both ossicles normal.* Tympanum, attic, antrum, and mastoid cells thoroughly curetted. Temperature rose to $100\frac{1}{2}^{\circ}$ the following day ; became normal on the third day and continued so until patient was discharged. In the third week after the operation, the opening behind auricle was permitted to close, and six weeks from time of operation the cavity had become covered throughout with epithelium. The discharge had entirely ceased. There was no cicatricial contraction of meatus ; in fact, it was larger than before the operation, permitting a large speculum to be inserted and all of cavity inspected.

CASE 8.—Nellie Hoffman, age two and one half years. Patient has been in the Cincinnati Hospital over a year. Treated both medically and surgically for intestinal trouble, eczema, etc., and at the same time treated by the Otological Department for a profuse aural discharge, most marked on the left side. All of the usual remedies had been faithfully tried, but in vain. Six months before the operation the adenoid vegetations in the pharynx were thoroughly removed and nose treated with the hope that this would influence the discharge from the ears, but without any avail. She is a typically strumous child with a very large abdomen and numerous enlarged lymphatics. The memb. tymp. of a dark red color, much thickened, and posteriorly there was a very large perforation.

Operated upon May 4, 1893.—Bone externally healthy. Antrum and attic found filled with pus and granulations. Posterior wall

of external canal removed. *Hammer and anvil both normal.* Parts thoroughly curetted. Mastoid cells not involved. Wound behind the ear closed by superficial and deep sutures, which were removed on the third day; union by first intention. Not the slightest evidence of any inflammation. It should be mentioned that the temperature fluctuated daily, but this condition existed for months before the operation. There had scarcely been a day during the month prior to the operation that the child did not have some temperature; and frequently it would run up as high as 104° , so that it is impossible to say how much, if any, of this pyrexia was due to the operation and how much to other causes.

June 4th.—Child looking better. Epithelium covered about one half of the total area of denuded bone, and the balance was protected by healthy granulations. There was only a fine, delicate red line visible behind the ear along the line of incision (see Fig. 8).

CASE 9.—William Ahems, age twenty-six. Patient is a miner by occupation. States he has never had trouble with ears until a few months ago, when he suffered from otalgia on the left side, followed by discharge of muco-purulent secretion. The discharge has continued ever since. There has been very little pain. When admitted to the hospital he had no fever or pain, but a very profuse and offensive discharge from the left ear. Could not hear watch on contact, and loud voice spoken into ear only very indistinctly.

Operation, May 11, 1893.—There was no external swelling, but on pressure one elicited tenderness over the mastoid. Anæsthetic, ether. Bone when exposed was found to be riddled with numerous small bleeding points, and in two places granulation tissue was protruding through the cortex. With a raspatory one of these openings was enlarged, and at once a jet of thick yellow pus poured forth, about a tablespoonful escaping. This was followed by a profuse flow of dark-colored blood, so that at first I thought the lateral sinus had been opened. The hemorrhage however, soon subsided. All of the external plate of the mastoid was now removed down to the apex and backwards and upwards a distance of two and one half inches from the meatus. The antrum and attic were filled with granulation tissue and pus. The anterior portion of the memb. tymp. was destroyed. Shrapnell's membrane intact. On removing the hammer and anvil, the former was found to be slightly necrosed, while there was no evi-

dence of disease on the latter. Backwards and upwards the bone was entirely destroyed, and over an irregular area the size of a half dollar, the thickened dura was exposed. It was in this locality that the accumulation of pus had taken place (subdural abscess), and the elasticity of the brain explains the jet-like escape of pus first mentioned.

During the operation patient's breathing became very bad, and it was necessary to elevate the body, and resort to artificial respiration. Operation continued with head lowered and body at angle of 30° , and anæsthetic changed from ether to chloroform.

Both external canal and the large defect behind the auricle packed with iodoform gauze. No temperature until the third day, when it went up to 100° . Bowels were freely evacuated, and temperature sank to normal, and has remained so. He was permitted to get up on the third day. Healthy granulations rapidly covering all of the denuded bone.

June 4th.—Patient could hear watch very distinctly on contact, and ordinary conversation within twelve inches of the ear. So that his hearing, even at that time, had at least doubled in acuity on this side.

June 6th.—Patient left hospital against advice, stating that he felt perfectly well and wanted to go to his home in Illinois. So that for the present, at least, this case has been lost sight of.

CASE 10.—John Battenfield, age twelve, was operated upon one year ago by myself. At that time the *classical mastoid operation* was made. The ear had never entirely ceased to discharge. There had been less pain and headache than before the first operation, but the discharge had been quite offensive and the ear tender in the region of the mastoid. His general health, however, had been most excellent, and he had developed very much physically.

Status Præsens.—Patient can only hear watch on contact and loud voice close to ear. There is no external swelling, but ear very tender to pressure, and patient will not permit of a careful examination.

June 1, 1893.—Admitted to private ward, Presbyterian Hospital; prepared for operation in the usual manner. After anæsthesia (chloroform), an examination was made through the external meatus, and with cotton carrier the parts carefully dried. The region of Shrapnell's membrane was represented by an opening filled with a grayish mass, strongly resembling chole-

teatoma. Further examination was prevented by profuse bleeding from the parts, resulting from the efforts to cleanse same, so that they could be carefully inspected. The usual incision was made, extending from the apex to lobe, behind the ear partly through the old scar, which was of a keloid character. When the knife passed over the mastoid where it was opened last year, it sank into a soft mass; and with the blood small caseous masses escaped. Periosteum was freely laid back and revealed an opening in the mastoid an inch long and half an inch wide, kidney-shaped, being a part of the area removed last year, which had never closed. Through the opening granulation tissue presented, and on removing this with the curette there was a free escape of fluid, almost clear in color, but having mingled with it numerous small particles of caseous material and grayish-colored, flaky masses, evidently from a broken-down cholesteatoma. The probe entered readily into the antrum and attic, which were unusually large, the walls being lined with a pearly-colored ragged, membrane, and in some parts this membrane had entirely disappeared, leaving denuded bone. All of the posterior osseous wall was chiselled away; the ossicles were carefully searched for, but the anvil had entirely disappeared, and of the hammer only the handle with the processus brevis and a fragment of the neck remained intact. The bone was honeycombed in all directions, the depressions being filled with cholesteatomatous masses. Every spot that gave the slightest indication of being the seat of infiltration was carefully curetted or chiselled out, until nothing but hard bone was found in all directions. The bleeding was very free from numerous minute bone vessels. The mastoid cells were free from cholesteatomatous masses, but filled with granulations and pus. All of the mastoid curetted and chiselled away, leaving only the shell of apex for insertion of muscle tendons. The diseased bone extended upward and backward two inches from the external meatus. Two sutures were taken above and below the wound and a large opening left behind the ear. Duration of the operation, one hour and fifty minutes.

CASE II.—Nicholas Brown, age seven years.

June 21, 1893.—Patient admitted to private ward of Presbyterian Hospital.

An effort was made to obtain hearing distance of patient's right ear. He seemed to hear ordinary low conversation at a distance of three or four feet.

Chloroform narcosis. The mastoid on the right side and for some distance back was distinctly enlarged as compared with the left, but there was not the slightest evidence of any inflammatory condition. There was slight tenderness on pressure over this area, and the swelling led me to suppose that it was caused by a large cholesteatoma pressing the cortex outward. When the periosteum was laid back the most prominent area over the mastoid was found to be of a bluish color, which led me further to believe that my original surmise was correct. Chiselling into the bone, however, by the usual method, I was much surprised on entering the antrum, to find this outer plate quite thick and composed of spongy bone, but filled with blood-vessels, causing free bleeding. The bone was not necrotic. Antrum readily entered. It contained cholesteatomatous shreds with slight amount of pus, but no granulations visible, and appeared very large and was lined with a pearly gray membrane. The probe passed readily into the attic. The posterior wall was removed and the ossicles carefully searched for, but there was not the slightest vestige of hammer, anvil, or membrana tympani. Of the stirrup, only the foot-plate remained intact. The cavities were curetted. A catheter was passed through the right nostril, and a bougie passed through the catheter so as to demonstrate its entrance through the Eustachian tube into the tympanic cavity, which was readily done.

The case was plainly one of disintegrated cholesteatoma, as only the lining membrane with enlarged cavities remained, the cholesteatomatous masses themselves having been washed away by the syringing and treatment which the child had undergone during the past few months, as the water could freely enter into the attic and antrum if sufficient force was used, because the ossicles and drum had been destroyed and all the cavities enlarged by the eroding effects of the tumor. The lateral sinus was exposed during the operation in three places, each about the size of a millet seed.

The cholesteatoma had eroded the bone backward and upward, being practically an extension from the antrum while freely curetting this cul-de-sac the probe came upon the dura, and further curetting was desisted from. Parts dressed as usual, leaving wound open behind auricle. Duration of operation one hour and twenty-five minutes.

CASE 12.—Julius Bludau, Jr., age eleven years.

June 22, 1893.—Thirteen months before I had made the *classical mastoid operation* upon this patient for incurable otorrhœa. The ear had never entirely ceased to discharge offensive matter, and there had remained tenderness on pressure over the mastoid especially near the apex. In this region the scar was of a keloid character, and contained a small fistulous opening which the patient stated had only recently appeared, through which a gelatinous substance exuded.

The odor from ear was very offensive, and a slight amount of thick pus was found in the external canal. There was a large opening in the posterior half of memb. tym. Middle ear filled with granulations. The condition of Shrapnell's membrane was not well defined.

Incision from upper portion of concha to apex of mastoid, passing through old scar. Periosteum laid back, and it was then found that the opening made in the mastoid before, had never entirely closed. When cleansing the external canal with a cotton plug, it forced thick pus out through the opening in the mastoid showing that there was a very free communication between the cavities. The old opening was enlarged, and the probe entered the attic readily. Found the aditus ad antrum very roomy. Posterior wall of external canal cut away. Antrum and attic filled with pus and granulations, the latter very large, almost polypoid in size. The anvil carefully searched for, but could not be found. With a sharp knife the rest of membrana tympani was detached, and the hammer removed. It was then found that the head of the hammer had been entirely eroded, but adhering to the neck by granulation tissue was a small remnant of the anvil, including a part of the articulation of either the long or the short process, the erosion had been so extensive that it was impossible to distinguish which of the two it was. The diseased bone was thoroughly removed. The middle ear was filled with granulations which were curetted to the mouth of the Eustachian tube. There was very free and persistent bleeding from numerous little bone arteries. Duration of operation, two hours. Opening behind auricle entirely closed by sutures and ear packed through the external canal.

Cases 8, 9, 10, 11, and 12 have all been operated upon during the past six weeks, and, with the exception of Case 9, who left against advice, are still under treatment. From

the others it will be seen that the shortest time for the parts to heal after the operation was six weeks, the longest, four months, and that in Case 3 where diseased bone was left behind and suppuration recurred.

The granulations must never be permitted to become exuberant, for then adhesions are sure to form across the angles of the cavity, leading to the formation of little canals and blind pouches that will materially interfere with the favorable progress of the case.

After the removal of the first dressing, the cavity should be carefully packed with very narrow strips of plain, sterilized gauze. As the granulations become larger we must make firm rolls from pieces of gauze about 1 *cm* square, and pack them tightly into the corners of the cavity, and as we approach the canal finish with short and narrow strips. Should the firm packing fail to control the granulations, they must be reduced with the curette or nitrate of silver stick. I have also been very successful in controlling them by packing the cavity with powdered alum for twenty-four hours; it seldom needs to be repeated more than two or three times.

All syringing and irrigating of wound after the first dressing must be avoided (excepting for removal of alum packing or in case the discharge should be very free and offensive), as it is injurious to the formation of new epithelium.

The hearing was improved in all cases; in some only slightly, in others very markedly.

In all of the cases the rise of temperature was practically nil, with the exception of Case 8, the child who had suffered from an irregular fever prior to the operation.

Eight times, or in 66 %, the hammer, and six times, or in 49 %, the anvil was affected; in 33 % both the ossicles were affected or entirely destroyed; and in 16 % both ossicles were normal. Cholesteatoma was found in 25 %, and in one (Case 9) there was also an extra-dural abscess present. There were no accidents of any kind, during or following the operations. With the exception of Case 3 there has been no recurrence up to date, so that of those discharged 85.8 % remained free from any evidence of the disease for which the operation was undertaken.

Upon Cases 10 and 12 I operated about one year ago for incurable otorrhœa, making the classical Schwartz operation, which permitted a free current of water to flow through the canal and out of the opening in mastoid, or *vice versa*. During the prolonged treatment which followed the operations the discharge was at a minimum, but could never be entirely controlled for reasons easily explained after making the radical operation. In Case 12 the ossicles were found almost destroyed and the roof of attic affected with caries, while in the other there existed an unrecognized cholesteatoma, with anvil totally and hammer partly destroyed.

These two cases are to my mind most excellent proofs of the great value of the radical operation and of its vast superiority to the old method in chronic cases.

A CONTRIBUTION TO THE ANTHROPOLOGY OF THE EAR IN CRIMINALS.

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Translated by Dr. WARD A. HOLDEN.

LONG ago artists and scientific men called attention to the varying aspect of the ear, and believed its form and size to have some relation to the character of the individual.

Morel (1837) showed that debased individuals had not only an altered moral nature, but also corporeal deformities. These latter were called *stigmata hereditatis*, and among them he, and later Lombroso (1871), included anomalies of the ear.

These were studied statistically and classified by aurists and anthropologists, and particularly by Gradenigo, Vali, and Petrona Eyle. The latter described as a type the "criminal ear." All agreed that the auricular cartilage in criminals and the insane showed more and greater anomalies of form than in normal individuals, and in proof of this view many statistics were collected after long investigations, carried out, however, without regard to any unit of measure. Gradenigo examined the ears of 15,000 normal men, and of 10,000 normal women, and noted the percentage of normal ears. He then examined 800 insane persons and 467 prisoners, noted the percentage of normal ears, and compared them with those of the first category.

He classified the anomalies as:

1. Simple adherent lobes.

2. Projecting ears.

3. Very large and moderate-sized lobes, etc.

Of the criminals only 28 per cent. had normal auricles, while of the normal men 56 per cent., and of the normal women 65.6 per cent. had normal auricles. Normal individuals then have normal auricles twice as often as criminals. This result would be satisfactory providing that one could establish a criterion of the normal ear and that the limits between a normal and an abnormal ear could be sharply drawn. This, however, has not been done.

In my opinion all these studies are of but relative value, since they only show that the investigator in question believes that anomalies of form are found more frequently in criminals than in others. But being based upon subjective judgment and not upon measurements, they cannot be verified by others.

What one would call a large ear, another would consider normal; what one would call prominent, might not be considered so by others, etc.

In order to possess scientific value the results should permit verification.

It has been my purpose, without taking into account the interesting results of these investigators, to endeavor to find out, with the assistance of statistics, whether the ears of criminals stand at a less reduced stage of development than those of normal individuals, in order to discover the anthropological position of the criminal ear.

Former investigators have studied only single portions of the auricle; my studies have taken into account the entire auricle. A marked reduction of the individual portions of the human auricle, and particularly the distance from Darwin's tubercle to the base line, as compared with the ear of the lower animals, are considered signs of a higher stage of development, while an abnormal size and excessive development are considered signs of degradation.

Measurement of criminals' ears to be of value must be compared with measurements of normal ears. In the *Festschrift für Prof. Virchow*, 1891, Schwalbe gives detailed statistics of measurements of the auricular cartilage in Ger-

mans, and my conclusions are drawn from a comparison of my results with his. Schwalbe's measurements were made on the dead bodies of normal individuals. I do not know what apparatus was employed. Usually in measuring the ears of criminals to determine their signalments Bertillon's measure is used. For my purpose I employed a plate of mica 10 by 5 *cm* engraved with a millimetre scale.

The measurements made were six :

1. Greatest length.
2. Greatest breadth.
3. Actual length, measured from Darwin's tubercle to the incisura auris anterior just above the tragus.
4. Actual breadth—*i. e.*, the base line.
5. The distance from Darwin's tubercle to the upper point of insertion of the auricle, upper line.
6. The distance from Darwin's tubercle to the lowest point of insertion of the auricle, lower line.

The last two lines, together with the base line, form a triangle, the height of which determines the degree of development of the ear. From these measurements the physiognomic index is calculated—*i. e.*, the relation between greatest length and greatest breadth of the ear (the expression for the physiognomic characteristic); and also the morphological index—*i. e.*, the relation between the actual length and the actual breadth of the ear (which is the expression for the anthropological characteristic).

Besides this I have determined the relation between the greatest length of the ear and the height of the individual, as well as the age, place of birth, and nature of the crime.

The measurements were made on ears of convicts in the prison in Christiania. The convicts ranged in age from 18–65, and may be grouped as follows :

15–20	20–30	30–40	40–50	50–60	60–70
22	148	58	18	2	4

The superintendent of the prison had the kindness to indicate particularly those who had been imprisoned more than once, as these might be supposed to represent a more degenerated class.

In the accompanying table the upper numbers are my measurements, and the lower those of Schwalbe. Where the latter are wanting the examinations have not been made.

From this table the following conclusions may be drawn :

1. Like Schwalbe, I find the length, breadth, and base of the ear increasing with the age. The fact that my numbers are smaller throughout is striking, as is also the decrease in length and breadth between 20 and 30, probably owing to a more excessive contraction of the cartilage at this age of greatest vigor.

According to Schwalbe, the increase in length, breadth, and base with age is due to a relaxation of the elastic fibres in the subcutaneous tissue of the cartilage, with the resulting decrease in curvature.

As the length increases more than the breadth, the physiological index becomes smaller.

The ear in old age is therefore actually larger than in youth, both in length and breadth, but relatively narrower, since the length increases more than the breadth.

2. The three distances from Darwin's tubercle to the base line decrease in age. Darwin's tubercle thus comes nearer the base line in advancing years. If the length, breadth, and base increase, this decrease must be due to the fact that in age the ear projects farther from the head than in youth, or that the helix-margin shrinks with age. The latter is not improbable.

Age.	15-20	20-30	30-40	40-50	60-70	Varies between	Average.
Greatest length. D. S.	62.1	60 60.3	63.3 63.7	64.1 63.7	66 67.4	51 and 75 50 and 80	61.35 65.9
Greatest breadth.	37.7	36.8 38.3	38.1 38.1	36.6 39.4	38.3 39.5	31 and 46 32 and 53	37.5 39.7
Base line.	40	40.8 41.9	41		45	34 and 49 33 and 58	40.6 44.4
Physiognomic index.	60.7	60.6 61.7	60.46	57.56		50 and 74 50 and 78	60.25 60.5

Age.	15-20	20-30	30-40	40-50	60-70	Varies between	Average.
Actual length.	31.7	31.2	30.6		29.9	23 and 41 22 and 49	31 35.9
Upper line.	31.9	31.4	29.9			23 and 41	31.2
Lower line.	44.3	43.9	43.7			34 and 55	43.8
Morphological index.	131.3	131.7	136.5		146.5	100 and 200 83.7 and 195.5	132.8
Relation between the greatest length of the ear and the height of the individual expressed in thousandths.	37.9	37.5	35.8	38.7	39.2	31 and 44	37.5 39.9

3. Up to the 30-40th year the length of the ear decreases as compared with the height of the individual. In infants of one month the relation is 7 %, and gradually decreases up to the 30-40th year.

Up to 30-40 the individual grows relatively faster than the ear; from 30-40 on the ear grows, while the individual becomes smaller, and the relation more nearly resembles that of childhood.

4. As was to be expected, my results are on the whole in perfect accord with the measurement of the ears of normal individuals.

Darwin's tubercle is not always present. In my cases it was found altogether in 49 % (Schwalbe, 73 %) ; bilaterally, 27.7 % (Schwalbe, 70 %) ; only on the right side, 14.6 % (Schwalbe, 12 %) ; only on the left side, 6.5 % (Schwalbe, 7 %) ; and in 51 % (Schwalbe, 11 %) altogether wanting.

It is remarkable that I found Darwin's tubercle so much less frequently than Schwalbe, and often so much lower on the helix.

My investigations and those of Schwalbe show that the form and size of the auricular cartilage vary with age in

the same individual. Nor can two persons be found whose ears are exactly similar.

Between 25-40, the ear changes least in a given individual ; before and after this period there may be a considerable change within a short space of time. Since, however, the ear retains its form in spite of mimic movements, it is well adapted as a signalment, and on Bertillon's recommendation it is thus used in France and other countries.

As has been stated, my measurements, as compared with those of Schwalbe, are small. The ears of Norwegian criminals seem to be smaller than the ears of normal Germans.

Measurement of eight ears of Lappish criminals showed the ear to be very small in comparison with the height of the individual (3.57 %), although all were small persons. The physiognomic and morphological indices were, however, normal. The Lappish ears are normally formed, but small.

My results in brief are as follows :

1. The size of the auricular cartilage and
2. The form of the auricular cartilage vary in the same individual with age.
3. The projection of the ear from the head increases with age.
4. The auricular cartilage of Norwegian criminals seems to be smaller than that of normal Germans ; and the ear is smallest in Lappish criminals, a lower tribe.
5. The auricular cartilage in criminals stands anthropologically on the same plane as in other individuals, since the morphological index is the same in each ; therefore, according to my investigations, there is no type which may be considered the "criminal ear."

CONTRIBUTION TO THE MICROSCOPIC ANATOMY OF THE HUMAN NASAL CAVITIES, PARTICULARLY OF THE OLFACTORY MUCOUS MEMBRANE.

By DR. HERMANN SUCHANNEK, ZURICH.

Translated by Dr. J. A. SPALDING, Portland, Me.

(*With Eighteen Schematic Drawings.*)

WHEN I spoke, in a previous paper,¹ of the peripheral border of protoplasm attached to the ends of the supporting and olfactory cells of the human nose in infants, I referred to some structures which I called the "*unpigmented bell cells*," in contradistinction to the pigmented cells in older children and in adults. But as the term "*bell cell*" hardly corresponded with the description I gave, I gladly adopt the more appropriate title of "*hand-bell cells*," as suggested by v. Brunn.²

In the paper referred to I remarked that the peripheral protoplasmic border exhibits a few round cells and nuclei apparently of an artificial nature, with a diameter of 0.009 mm, and with the protoplasm arising around them in a conical shape, so that the cell and nucleus together measure 0.015 in diameter.

In addition to these *unpigmented* structures we see in children and adults some that are pigmented.

My opinion of these pigmented cells, as expressed at the time, but based on a very small number of examinations,

¹ *Archiv f. Micros. Anatomie*, Band xxxvi., p. 375.

² *Ibid.*, Band xxxix.

was that they were either offshoots of the pigmented supporting cells, or else pigmented leucocytes. I also felt compelled to abandon the idea, expressed in my previous papers, that they were *specific elements of special sense*.

We now know, in agreement with Stohr's observations, that there is nothing remarkable in the presence of migratory epithelial cells wherever in animals we find a subepithelial locality for the propagation of leucocytes. For this reason Stohr was able to demonstrate them in the respiratory region of the nasal mucous membrane in men as well as in animals.

There is, then, no reason for further explaining why I called the unpigmented elements which are here and there seen amidst the long, oval, and upward pointed cells *unpigmented cells*, and all the more so, as they had lost their pedicles. And yet, after all, my original opinion, that a part of the specimens might be artificial productions, was the more correct, for I have regarded as oval cells those which were actually the results of a post-mortem appearance.

For all these reasons I now recognize, in the human olfactory mucous membrane, in addition to the supporting fibres, typical olfactory, and basal cells:

1. Genuine leucocytes, nine-pin shaped and oval, with hyaline contents, and resembling the transitional forms to which I will later return.

2. Cells which resemble leucocytes, but which in verifying preparations, and in a successful series of sections, prove to be *cellular elements with a pedicle*.

We find in perfectly perpendicular thin sections that we can recognize a pedicle. In this class belong the oval or conically inclined cells, which would seem to be *atypical* olfactory cells—*atypical* in that they exhibit a direct subdivision of nuclei, something not yet seen in my experience in the typical olfactory cells. But such an opinion can only be maintained when we can succeed in connecting their basal terminations with those of the olfactory nerve. Such a proof has been demonstrated concerning the genuine olfactory cells, but not, so far, of the atypical cells, as I call them.

Finally, the atypical cells have been seen not only in well developed, but in atrophic olfactory mucous membrane, and similar cells have been described in the respiratory nasal mucosa.

3. Transition cells from the pigmented "*bell cells*." These belong to those elements that have not hitherto been distinctly described, and have a small amount of pigmentation and hyaloid contents. Their position near the pigmented bells, and the change of position in their nuclei, remove any doubt of their also being cells without a pedicle. So far I have never seen this form except in a case of diabetes mellitus, and I leave it an open question whether they are normal or pathological, although I must insist that they are seen both in well developed and atrophic olfactory mucous membrane.

4. Distinctly pigmented, round, long, or transversely oval cells, *i.e.*, pigmented bells with a pedicle, seen everywhere in the epithelium. When oval their longitudinal axis is generally parallel to the longitudinal axis of the rest of the epithelial cells. The nucleus may be at any part of the cell. These I call migratory cells, an opinion with which most authorities agree, though some think that they are not solely migratory. There are only a few cells on the surface, but they may have been washed away by the secretions of Bowman's glands.

v. Brunn estimates the proportion of pigmented bell cells in comparison with the rest at about ten per cent., but, in my opinion, they vary greatly. I have often seen as many as fifty per cent. in well preserved sections from people who had enjoyed keen sense of smell.

The variations in the development of the zone of olfactory cells, at different ages, and their disappearance in primary atrophy of the olfactory mucous membrane seem to have escaped many observers in this field of investigation. Possibly they have regarded the zones of primary atrophy as respiratory epithelium, or as one observer says he saw pigment not only in the epithelial cells of the olfactory region, but in the ciliated cells. But I insist that outside of the region covered with olfactory epithelium in the new-born,

i. e., as far down as the lower border of the inferior turbinated bone, I have never found any pigmented epithelial or ciliated cells.

In following down the successive thinning of the zone of olfactory epithelial cells, the supporting cells remaining of the same thickness, I was led to the idea of the specific nature of the olfactory cells. The presence of pigmented bell-shaped cells and the simultaneous absence of the olfactory cells support the diagnosis of atrophic olfactory epithelium. Further aid comes from the absence of the basal membrane of olfactory fibres and of Bowman's glands.

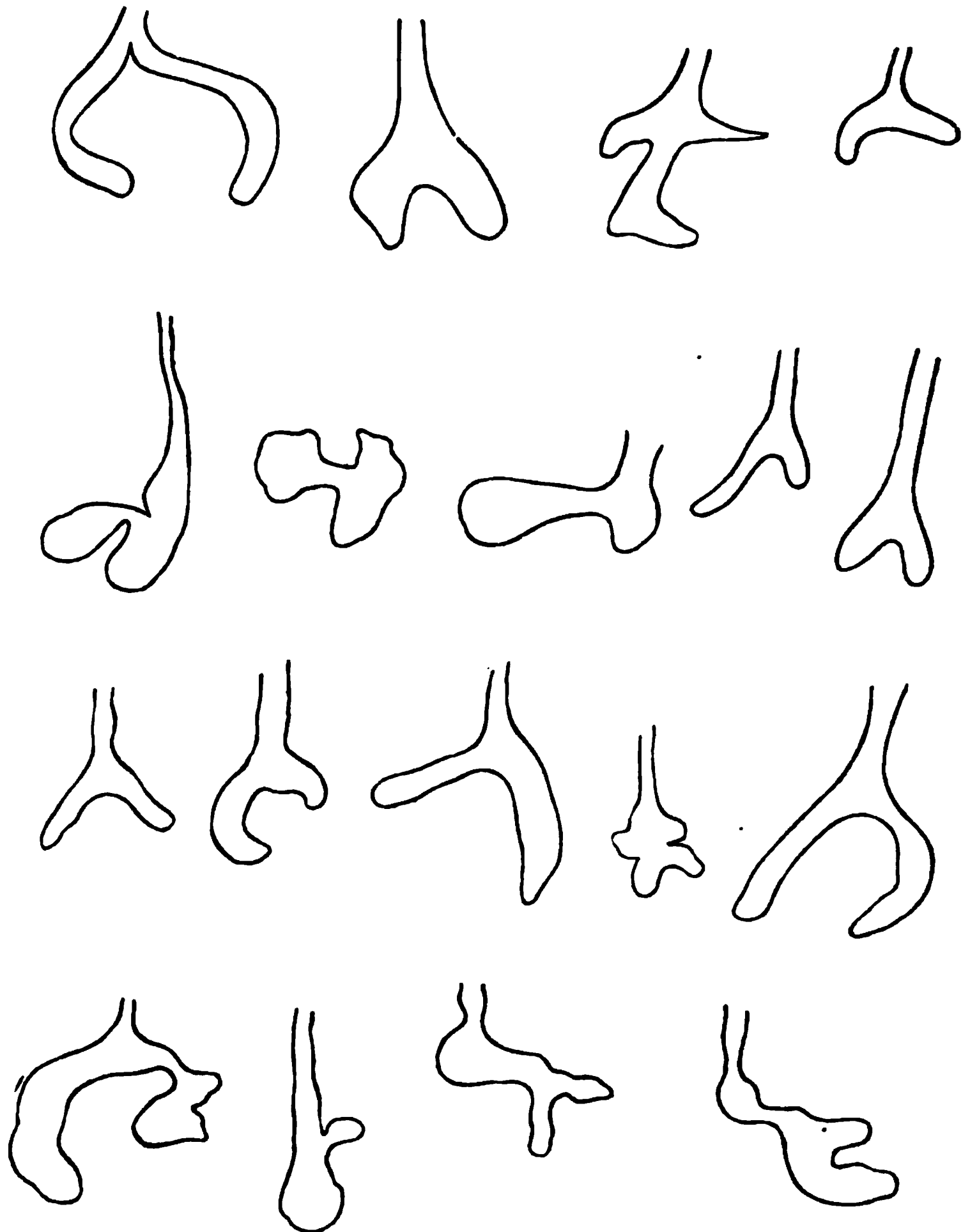
Some observers completely ignore primary atrophy of the olfactory epithelium and regard as a morbid process that which is perfectly normal, in other words, the bags of Bowman's glands.

A systematic microscopic examination of acute and chronic catarrh of the nasal mucosa carried on for the past five years proves to my satisfaction that alterations in the epithelium may go on independent of those in the tunica propria, *though they may exist together*. Thus we often find alterations in the epithelium with an intact tunica propria or a normal epithelium beneath which is œdema of the connective tissue and catarrh of Bowman's glands. Again, I have learned from study of acute inflammation of the mucosa of the nostrils, that together with œdema of the tunica propria we may have pronounced enlargement of Bowman's glands, at one time with mucous and cellular contents and at another without.¹ Even the absence of contents has not hindered me from diagnosing a pathological cystoid enlargement of Bowman's glands, since I know that in a semi-normal nasal mucous membrane Bowman's glands resemble those in a *healthy* animal—*i. e.*, *not thus enlarged*, and that, on the contrary, even when the contents are absent, this enlargement might be due to gas-forming microbes. Such air cysts have been seen in the vagina and in nasal polypi. Why should not then such gas-forming fungi reach Bowman's glands and enlarge them under pathological

¹ Bowman's glands often react to disturbances of circulation and respiration of a very brief duration.

conditions, when we know that in the nostrils we have the home for a complete Flora of microbes!!

As the subjoined sketches show, mostly two glandular tubes are united into one canal of exit lying just beneath the epithelium.



Schematic representation of Bowman's Tubular Glands from the healthy Tunica Propria of the Olfactory Region of a Woman of Thirty who died of Diabetic Coma.

The mutual relation between glands and adenoid tissue can only be correctly judged when, bearing in mind the rela-

tion between infant and animal, we compare the normal and pathological anatomy of the olfactory region in children and adults. According to this, in infants, the tunica propria is provided with glands, olfactory fibres and vessels, and all the structures are united with a thin adenoid tissue. In the early years of childhood the lymphatic tissue increases in amount, surpasses that of the slower-growing glands, and we find germ-centres in ovoid or nine-pin-shape form. In the course of years up to thirty the germ layer collapses. Then we find in the tunica propria of the olfactory region olfactory fibres, blood- and lymph-vessels, and lines of pigment all bound together with a fine network of connective tissue with a few leucocytes. When the conditions are normal (a rarity in the nasal mucosa of adults) it is impossible to say that the amount of adenoid tissue equals that of the respiratory region. But in morbid conditions, such as congestion, hypertrophic nasal catarrh, ozæna in the early stages, etc., the lymphatic tissue is by far the more predominant.

The irregular manner in which the olfactory epithelium is expanded over the interior of the nostrils, is not surprising, when we recall the extreme variety in the structure of the nasal cavities (septal deviation and the various configurations of the turbinated bones, etc.). For these reasons the path for the passage of air will vary in each patient, and the irritating foreign bodies which penetrate the nose will always fall on the same portions of the respiratory and olfactory regions. In catarrhal conditions, we shall first meet with congestion of the secretion where the exit of mucus has been prevented or obstructed by the abnormities of the shape of the nostril.

In regard to the olfactory hairs I would say that unlike some observers I have never been able to obtain a good view of them in any of my sections.

The acinous and occasionally the tubular glands exhibit a formation of chalk in guttate or glandular form.

A PECULIAR CASE OF SO-CALLED BEZOLD'S MASTOIDITIS.

BY DR. W. VULPIUS, OF NEW YORK,

ASSISTANT SURGEON N. Y. OPHTHALMIC AND AURAL INSTITUTE.

CASES of mastoiditis in which the pus, imprisoned in the mastoid antrum and cells, seeks an outlet by perforating the medial wall of the tip of the mastoid process, and passes from the incisura mastoidea beneath the muscles, whose attachments surround the outer and inferior surface of that tip, forming a deep-lying abscess, which burrows along the deep fasciæ of the neck or the sheath of the great vessels and nerves—I say, cases of this kind are not so rare either in practice or as recorded in literature, as to justify the publication of a single one unless it presents some peculiar and instructive features.

Strangely and unjustly, this form of mastoiditis has been baptized in the name of Prof. Bezold, who, in No. 18 of the *Deutsche medicinische Wochenschrift* (1881), published a paper which, by its inscription, indeed assumed to point out a new way on which a suppuration might, from the cavities of the middle ear, extend into the neighborhood. He ignored the fact that as early as in the year 1847 already Kuh and 1872 Böke had demonstrated that way by pathological specimens of carious petrous bones, and that Prof. Schwartze had recorded operations of such cases before.

It has been observed by different authors that the alleged form of mastoiditis almost exclusively occurs in consequence of acute otitis media, and prevalently in elderly persons, where, it is suggested, the more developed cellular structure

of the tip of the mastoid portion favors the propagation of the purulent process in a downward direction.

Our case was that of a young woman of twenty-eight years of age, who, on the 5th of May, 1893, presented herself in the dispensary of the New York Ophthalmic and Aural Institute with a running and lately aching left ear. She had not cared much about the discharge, which nine days ago had relieved her from a very severe earache lasting for two nights and one day, but resorted to medical help only when the pains recurred. Inspection showed, after the careful removal of a moderate creamy discharge from the auditory canal, a congested, bulging drum-membrane with a small perforation in the middle of the posterior half, with a pulsating reflex. The mastoid portion was tender and slightly oedematous.

After instilling some drops of cocaine, I immediately enlarged the perforation with a paracentesis needle, liberating a considerable quantity of pus, and ordered the patient to cleanse her ear and make cold applications behind it. This gave relief for a few days, but on the 8th the incision, which from the beginning did not gape, was closed again, and the same symptoms of pus-retention recurred.

I then proceeded to establish a more thorough and prolonged drainage by making under ether-narcosis a galvano-caustic paracentesis. I used for that purpose an instrument with a rather long platinum-wire loop, bent to form a blunt point, as originally devised by Dr. Jacoby, of Breslau. The effect of this paracentesis was still more unsatisfactory than that of the first, for, by the faulty construction of the galvano-caustic burner, singeing of the walls of the auditory canal as well as of the neighboring parts of the drum-membrane was inevitable, and the former being by nature rather narrow, the swelling of its integuments, which did not abate before some days, caused an obstruction hardly less considerable than the original narrowness of the perforation.

So, when on the 13th of May I repeated the last operation with an improved instrument and a very satisfactory result as establishing a free drainage of the tympanic cavity by a sufficiently large, round, and sharp-edged perforation without swelling of the adjacent parts, the mastoid inflammation had in the meantime proceeded and by the 14th developed into a well circumscribed, distinctly fluctuating swelling over the typical point for

mastoid abscess, viz., behind the auricle at the height of the upper wall of the auditory canal. No symptoms whatever pointed to the escape of pus from any other place of the mastoid.

Therefore on the fifteenth the typical mastoid operation after Schwartz was performed, evacuating a great deal of pus from the subperiosteal surface as well as from the mastoid antrum, which was struck by the gouge in a depth of about 7 *mm* from the bone surface, but showing no macroscopic communication of these two deposits of pus through the separating bony wall. Following the valuable advice of Schwartz, not to be contented with picking or boring a small hole for drainage into the carious cavity, but to lay it entirely open by chiselling off all the undermined bone, I was led by the probe downwards to the tip of the mastoid and actually found an opening there through which on pressure upon the side of the neck a great quantity of thick pus welled up. It came from a big abscess-cavity burrowed very deeply under the sterno-cleido-mastoid and splenius capitis muscles, extending posteriorly nearly to the median line of the nape of the neck.

This cavity, which was coated with a viscid abscess membrane, and the carious bone cavity, filled with soft granulation tissue, were scraped out and at the lowest point of the former a counter opening was cut for the insertion of a thick wick of sterilized gauze.

The first dressing was changed after five days; the second four days later. Granulations sprung up very slowly, the healing of the wound proceeded quickly after the second week and was complete five weeks after the day of the operation.

The discharge from the meatus decreased quickly and stopped entirely in about a week after the last paracentesis; one week and a half later the galvano-caustic opening was closed, and when I saw the patient for the last time—six weeks after the operation—the hearing on the operated ear was nearly normal.

I need not sum up what accounts for the diagnostical and clinical interest of the case. Mixed cases of abscesses behind and below the ear in consequence of mastoiditis have been recorded by Bezold as well as by other authors; but it is very rare that in such cases no symptoms point to the by far more serious of the two complications, and that the latter could only be detected during the course and rational extension of the operation.

I return now to what with regard to the prevention of such complications our case may teach us.

I agree with Dr. Sexton that a great many mastoid complications may be prevented by establishing a free drainage of the drum-cavity in acute or chronic middle-ear suppurations, even if I am not at all of his opinion, that all such complications—if once present—ought merely to be treated by the way of the drum, to refute which theory nobody could give more striking examples than Dr. Sexton himself does in his book, *The Ear and its Diseases* (see for instance case 5, page 295; and case 1, page 314). There are two possible ways in which acute middle-ear suppurations may become complicated by mastoiditis: either the same infective process invades simultaneously with the mucous membrane of the drum that of the mastoid cells and antrum—many of the influenza cases of mastoiditis seem to be based on such extensive primary infection, and here the mastoiditis was sometimes previously and more intensely developed than the drum inflammation; or the drum-membrane is either individually or by a special form of inflammatory infiltration so dense and resistible that it does not give way but to a very high pressure from the side of the imprisoned pus, and even then maintains by the narrowness of the effected perforation a constant tension which is liable to force infective material into the remoter cavities of the mastoid.

In the latter division of cases timely paracentesis of sufficient drainage power will prevent the mastoid complication. But the same dense and solid character, which did not admit of a sufficient natural drainage, will greatly restrict the efficiency of an incised perforation. In such membranes there is no elasticity to draw the edges of a cut asunder and change it into a gaping opening. These edges, therefore, remaining in permanent apposition are quickly (sometimes in less than a day) reunited, and so the *status quo ante* is restored.

In such cases only the galvano-caustic paracentesis gives the possibility of a sufficiently free and lasting drainage, but the instruments commonly used for that purpose are by no means so perfect as they ought to be for an operation in the

depth of a narrow canal with very irritable walls. This evidently being the reason for the still too limited application of the galvano-cautery in aural surgery. I beg briefly to point out the principles for the rational construction of galvano-caustic ear-instruments, and give a description of the one which I now use to my complete satisfaction for the alleged purpose.

The shanks of galvano-caustic ear-instruments ought to be made of the best conducting metals, copper or silver, so that, notwithstanding their necessary slimness, the greatest possible difference of conductive power between them and the platinum end-piece may be preserved. This permits the use of an electric current, weak enough not to heat those shanks to any harmful degree, but strong enough to produce a quick and bright glow of the platinum part. The latter ought to be as short as possible, so that the glowing takes place only at the point where it is immediately needed and does not extend through any length of the auditory canal. It should be of such a shape as to glow, with the least possible loss of heat by irradiation, most instantaneously, if the circuit is closed, and as to produce by one short glow a sufficiently large perforation.

All these conditions are best fulfilled by round platinum-wire, as being the most compact form, in comparison with flattened or dome-shaped pieces, which concurrently with their augmented surface favor injurious radiation, and at the same time lessen thereby the concentration of the glowing effect.

In the author's instrument a narrow and short platinum-wire (of 0.4 *mm* diam.) loop at the end of the slender, varnished, copper or silver shanks (of 1.0 *mm* diam.) is doubled on itself to form a shallow hook, whose foremost part, brought in contact with the drum-membrane, covers a sufficient area for a good-sized perforation by once sinking it quickly through the membrane.

In cases, where the operation is indicated by the rigidity of the drum-membrane, the latter is generally not very sensitive, and if by instillation of some drops of cocaine (10% sol.) it can be made to bear the blunt, cold point of the

galvano-caustic burner put on it with a slight pressure, no other anæsthetic for making the paracentesis is required. The action is so instantaneous that the ensuing pain hardly is felt before it is done ; after the quick withdrawal of the instrument from the meatus, one should never fail to expel by blowing into the ear the hot vapors produced by the glow heat from the moist tissue.

It gives a characteristic sensation if the instrument, which rested on the drum-membrane, breaks through as soon as it is made to glow ; and, if this sensation of irruption is felt, no further evidence of the effectiveness of the operation is needed, even if immediately afterwards the slough does not yet permit of a clear view of the perforation. The slough is generally shed off after some hours or a day, and then the drum-membrane shows a clean, round, sharp-edged hole, which perfectly answers the required drainage.

AN UNUSUAL CASE OF BILATERAL FRACTURE OF THE TEMPORAL BONE.

BY DR. W. VULPIUS, NEW YORK.

On the 23d of January, 1893, a working man forty-five years of age came into the dispensary of the New York Ophthalmic and Aural Institute to seek relief for deafness and annoying noises in his right ear. These troubles were the consequences of an accident, whose history is the following: On the 28th of November last year the patient was occupied in throwing timber down into a cellar, over which he was standing on a plank. Suddenly the latter broke, and the man tumbled about twelve feet into the cellar, striking the floor with his head. When he recovered from an unconsciousness of indeterminable time, he noticed that his nose and mouth were bleeding, but could not remember anything definite about his ears. Being unable to rise, he was carried to Bellevue Hospital, and obliged to stay in bed for two weeks and a half. During this time he suffered from severe headache and felt very dizzy; his right eye was closed by a swelling, and there was a wound at the back of the right auricle near its upper attachment. The dizziness abated very slowly, so that even at the time of his presentation in the Dispensary he was obliged to use a cane for taking any long walk. The clinical examination showed the right auditory canal perfectly clean, the membrana tympani nearly normal in its appearance and even more delicate and transparent than could be expected, so that the long process of the incus could be distinctly seen; the translucent promontory wall below the oval window had not its common yellowish-white color, but showed—especially by diffuse daylight—a tinge of pink.

The deafness was very considerable; when the left ear was tightly closed, only words shouted close to the right one, or spoken

loud and plainly through a conversation tube, were understood. Tuning-forks of different pitch were not heard either by bone-conduction from the forehead or the mastoid process, or by air-conduction, when the prongs were held near the right meatus.

The left auditory canal was almost entirely filled with what on inspection seemed a plug of impacted cerumen, but after its removal proved to be most of it a hard and solid clot of inspissated blood. The blood had most probably issued from a point in the upper wall of the auditory canal quite near the posterior circumference of the tympanic ring, where some marks of the hemorrhage were still visible. The left drum-membrane, too, was uninjured, it looked a little duller than the right one, but cleared up perfectly during the following weeks of observation. The hearing on this side was only little impaired; whispered words were heard at a distance of eighteen to twenty feet. The tuning-fork examination gave no constant and reliable result.

Besides this ear affection there was facial paralysis of the right side extending to every twig of the nerve. The patient was unable either to frown his forehead or to close his right eye; the cheek flapped loosely, the upper lip could not be raised, nor the mouth pointed for whistling; smiling drew the lips to the left side, and the right angle of the mouth was lowered. All facial muscles of the right side showed the characteristic electrical reaction of degeneration, which indicated a peripheric lesion of the nerve; but there was another symptom which allowed even a closer localization, viz., the loss of taste at the anterior part of the right side of the tongue, which pointed to a simultaneous lesion of the chorda tympani, so that the fracture of the temporal bone on the right side had likely passed between the origin of the large petrosal nerve and the branching off of the chorda, probably involving the oval window.

So the peculiarities of the case were: first, that there was no evidence of any bleeding having taken place from the ear on the prevalently affected right side, while on the left side there was a blood-clot and local marks of ear-bleeding even after some weeks, so that one could be induced to think of that escape of blood into the outer meatus having acted like a safety-valve for the labyrinthine organs and the facial nerve, which on the right side were exposed to the injurious pressure of an imprisoned hemorrhage.

Second: that the complication of the traumatic deafness with

a total paralysis of the facial nerve and the chorda admitted a more precise localization of the fracture on the right side, than can be made in most cases of this kind.

On the 27th of September, 1880, Dr. Buck of this city read a paper on the fractures of the temporal bone before the New York County Medical Society, to whose propositions the above said peculiarities put my case into an immediate reference.

As to the diagnostic significance of hemorrhage from the ear, Dr. Buck quoted in his paper from Prescott Hewett's article on fractures of the base of the skull: "that with a serious bleeding from the ear continuing some time a fracture of the temporal bone may be safely diagnosed." He stated then the necessity of a fresh study of this whole subject of fractures of the temporal bone, because the clinical observations hitherto made lack records of a thorough aural examination, and added to the propositions given by Hewett, the following: "When a fall or blow upon the head is followed by bleeding from the ear, no matter how trivial, we may diagnose a fracture of the temporal bone in the neighborhood of Shrapnell's membrane, and probably in the line of the Glaserian fissure." This would justify the diagnosis of the bilateral fracture in our case, even if the clinical interest was by the grave symptoms of deafness and facial paralysis concentrated to the right side.

Dr. Buck continues further: "The necessity of such examinations is shown very clearly in those cases of fracture in which no outwardly visible hemorrhage or other discharge takes place from the ear," a combination, of which he had himself no opportunity of making a clinical observation, but for the illustration of which he gives the history of a case, which was treated and died in the New York Hospital, and of which Dr. Peabody made the post-mortem examination. A literary review of records of similar cases of fracture of the temporal bone shows that concurrently with Dr. Buck's statement most of them are viewed from a surgical standpoint and lack an early and thorough aural examination;

one series was published by Dr. Bernhardt in vol. vi. of the *Archiv für Psychiatrie* to refute the significance of the so-called paradoxical galvanic reaction of the auditory nerve, which was first demonstrated and put stress on by Brenner.

In the same year (1876) Dr. Kétli of Budapest published a case of great interest on account of the extent of its lesions; there were paralyzed both abducent, aural, and facial nerves with the chordæ.

Many other records are scattered in the medical periodicals and in hand-books, but as Dr. Buck's demand of a revision of the subject from an otological standpoint stands valid even now after a thirteen years' interval, I am glad to be able to contribute to the fulfilment of this demand by the communication of the above detailed case.

A CASE OF REMOVAL OF THE STAPES.¹

BY PROF. FRIEDR. BEZOLD, MUNICH.

Translated by Dr. WARD A. HOLDEN, New York.

IT is of prime importance, for our knowledge of the conducting apparatus, to know how much the ear is capable of hearing after removal of particular portions.

Long before the malleus and incus had been removed by operation, we were aware that a considerable amount of hearing might exist with only the stapes present. And at times the entire region of the pelvis ovalis lies bare, neither the head nor the crura of the stapes being visible, while a whisper can still be heard at several metres' distance. In such cases we assume that at least the foot-plate of the stapes and the annular ligament are intact, and it might be supposed that the foot-plate impinging on the annular ligament had a function in receiving impulses and particularly sound waves similar to that of the large otolith found in the lower animals.

In all these cases of disturbance in the conducting apparatus, besides the relative functional defect shown in the decrease in hearing distance, there is also an absolute defect shown in the absence of perception of the lower portion of the tone-scale by air-conduction, while the bone-conduction for the lower tones is increased.

These questions have a particular interest at present on account of the latest reports from the United States showing the beneficial effect on the hearing from the operative removal of the stapes.

Up to this time most otologists, notwithstanding some reports in the literature to the contrary, have agreed with

¹ Read at the second meeting of the German Otological Society.

Toynbee's opinion that with the loss of the stapes the hearing is abolished. Several autopsies of cases of tubercular purulent otitis with detachment of the stapes, and a case in which the foot-plate was replaced by cicatricial tissue, all being totally deaf in life, led me also to the same opinion.

Ludewig¹ removed the stapes twice, but in one case the hearing was not reported; Grunert² in one case obtained an improvement, a whisper being heard at 1 m, whereas before it was heard only at $\frac{1}{2}$ m. Since then three cases have been operated in Schwartze's clinic. Of the six cases, deafness resulted in one, in two the test of hearing was not reliable, and in three there was an improvement later. The hearing of the unoperated ear was not reported in these cases.

I come now to Jack's reports from a reference in the *Monatschr. f. Ohrenh.*, 1892, No. 77. We learn that in the course of a few weeks he removed the stapes in seventeen cases, two with otorrhœa, others in which an otorrhœa had run its course, and others pure cases of sclerosis. Once a small portion of the foot-plate remained, in another case the crura were but partially removed while the foot-plate remained in position. Yet in all seventeen cases he obtained a marked improvement in hearing, particularly for the voice, which lasted through the four months that the cases were under observation. The reaction was always slight. In one case of total deafness, the day following the operation a whisper was heard at seven feet.

Blake (*Boston Med. and Surg. Journ.*, Dec. 8, 1892) also reported two cases of removal of the stapes in old sclerosis. In the first case the crura broke off and the foot-plate remained. Galton's whistle was heard better. In the second case the entire stapes was removed. No report is given of the hearing.

After reading these reports it would appear that in chronic obstructions of the conducting apparatus it is only necessary to remove the stapes in order to obtain a certain improvement in hearing. The question of the amount of hearing retained after removal of the stapes seemed to me so im-

¹ *Arch. f. Ohrenheilk.*, xxix., p. 261, and xxxi., p. 228.

² *Ibid.*, xxxiii., pp. 219, 222, 236.

portant both in its physiological and its practical aspects that I was persuaded to make the operation in at least one case, the history of which is as follows:

Mrs. K., æt. forty-eight, suffered from hardness of hearing for years, with constant tinnitus for a year. In both ears there are the results of purulent otitis media, with persistent perforation: R, a kidney-shaped perforation in the posterior upper third of the *Mt.* The malleus handle is adherent to the promontory, the long process of the incus and the stapedius tendon lie free; the niche of the fenestra rotunda is also visible. The mucous membrane is of a pale yellow color. Clear perforation sound. L, a depressed cicatrix at the posterior periphery with a small perforation through which the air passes freely in Politzerization.

		Whisper	Ordinary conversation
	Right	2 cm	20 cm
	Left	10 cm	90 cm
	Lower tone-limit	Upper tone-limit	Rinne
Right	C(64)	Galton 1.7	— 7 sec.
Left	A(110)	Galton 2.3	— 5 sec.

A on the vertex, hearing ear not determinable, + 12 sec.

a' on the vertex, hearing ear not determinable, — 2 sec.

Extraction of the stapes was done on the right, poorer ear. After cutting the stapedius tendon and trying to disarticulate the inco-stapedial articulation, an attempt was made to remove the stapes with various hooks. This not being successful the head was seized with a fine forceps and the entire stapes removed by gentle traction. There was no escape of serum. The mucous membrane adhered to the head and the crura of the stapes, while the inner surface of the foot-plate was of a bony-white color. This would indicate that not only the periosteum, but also the cartilaginous structure covering the foot-plate, had remained.

The operation was done under cocaine and was not painful. At the moment of removal the patient sank on the other side with a sigh and became pale. She retained consciousness. On account of the relaxed condition of the patient, tests of the hearing at that time were unreliable.

The excessive giddiness lasted three days. She then complained of tinnitus. Whisper not heard in the right ear, ordinary conversation uncertain, not better with the right ear open than

with both closed. Only the forks c' and f' were heard by air-conduction, and the other ear could not be excluded with certainty from perception. The A fork on the vertex was referred to the operated ear.

The ear remained dry. The dizziness lasted three weeks. There was continuous tinnitus but chiefly in the unoperated ear.

Examination at this time showed that a whisper was not heard, loud conversation was heard near the ear, many numbers incorrectly. Lower tone-limit for air-conduction fork A, from this up all forks and whistles heard to the upper limit 2.3 Galton.

The last examination, made ten weeks after the extraction, shows the mucous membrane of the tympanum pale and dry, in the region of the stapes an irregular gray depression with numerous reflexes.

Conversation heard at 3 *cm*. The upper and lower tone-limits as before. Fork A on the vertex is perceived by the right ear and is heard 17 sec. longer; a' on the vertex is heard in the right ear and shortened 3 sec. Rinne a' R — 10, L — 6 sec.

The result of the operation for the first few days was absolute deafness. After three weeks some hearing returned, but remained always much less than before the operation.

This return of hearing I would explain by my previous theory that pressure on the membrane closing the fenestra ovalis may act favorably on the hearing. In our case, while this could not have been done by the foot-plate, it may have been produced by the thickened and ossifying cartilaginous structure. The same effect is got by the cotton pellet, which in my experience has improved the hearing only when it caused pressure in the region of the stapes.

It seems important to publish this case as soon as possible in order to warn others against unfavorable results. In cases which may be operated in the future it is desirable that the functional tests may be very carefully carried out and reported in full.

Blake has kindly informed me that in his two cases there was no permanent improvement, but in one a decrease from $\frac{1}{8}$ to $\frac{1}{16}$ for the fork. Ludewig has written me that he found deafness in six cases of unintentional extraction of the stapes.

REMOVAL OF THE STAPES.

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THE following cases are reported in continuance of the communication made in previous numbers of this journal as illustrating the results of attempted removal of the stapes in cases of chronic non-suppurative disease of the middle ear, and are selected from those which will be tabulated later, because they set forth certain points, both in the operation and in the symptoms attending it, which are of interest.

S. N. D., a man forty-five years of age, who, in consequence of chronic progressive thickening of the tympanic mucous membrane incident to a slight chronic naso-pharyngeal catarrh, had been steadily losing his hearing during a period of several years, applied for operation in the middle ear in the hope of obtaining some improvement. Upon examination on the day of operation, the left membrana tympani was found to be intact and of very nearly normal transparency. The Politzer acoumeter was not heard; the tuning-fork (562 v. s.) was also not heard aërially, and by bone-conduction over the left mastoid process only $\frac{1}{8}$. The voice was heard, but was not understood at a distance of one foot from the left ear, the right ear being tightly closed.

The preliminary incision in the membrana tympani was made opposite the round window without cocaine and continued upward for a distance of two millimetres, when, in consequence of the pain caused by the incision, it was necessary to make an application of a few drops of a ten-per-cent. solution, and as the patient was exceedingly nervous and dreaded the pain several applications became necessary. The opening in the membrana

tympani being completed the incudo-stapedial joint was plainly visible, and as there was no improvement in hearing consequent upon the opening in the membrana tympani it was decided to proceed further; the stapedius tendon was therefore divided, as was also the incudo-stapedial articulation, both of these manipulations being accompanied by a sensation to the patient of a rasping or scraping noise.

Attempted mobilization of the stapes showed that bone to be firmly fixed at its base, as a fine probe passed into the niche and around the stapes gave no evidence of merely superficial adhesions, and there was no improvement in hearing after slightly attempted mobilization.

Firm traction by means of a blunt hook passed under the head of the stapes from below resulted in a fracture of the anterior crus close to the head and of the posterior crus close to the base plate, this fracture being accompanied by a sensation to the patient of a sharp report.

Tests of the hearing made before, during, and after the operation showed it to be unchanged.

The opening in the membrana tympani was closed by a paper dressing, and at the end of five days had entirely healed.

As an illustration of the occasional effect of cocaine it may be stated that within five minutes after the operation the patient, who had been previously flushed, became pale, the pulse became slow, and there was first vertigo, then nausea and vomiting. These symptoms persisted for over an hour and had evidently, from the lapse of time between their appearance and the attempted mobilization of the stapes, no connection with any interference with that ossicle. Twenty-four hours after operation the patient was entirely free from the unpleasant symptoms referred to and had neither pain nor discomfort in the ear.

W. N., a man forty-eight years of age, whose hearing had been slowly decreasing in both ears for several years until conversation, except in the right ear and in a very loud tone of voice, had become impossible applied for operation. In both ears there was thickening of the tympanic mucous membrane in consequence of progressive chronic non-suppurative disease, and the hearing in the left ear was so far impaired that the Politzer acoumeter was not heard at all, and the tuning-fork (562 v. s.) was heard neither by aërial nor by bone-conduction over the mastoid. The left membrana tympani was very much depressed, the long process of the

malleus fore-shortened, and the posterior segment indrawn and tense, and the division of this segment in the course of the incision allowed the tensor tympani to draw the malleus still farther inward.

The patient was especially sensitive to pain, and the effect of the local application of cocaine in the progress of the peripheral incision passed off within two minutes, so that frequent applications were necessary. After the opening in the membrana tympani had been finally made the incudo-stapedial articulation was found to be plainly visible and the tympanic cavity quite deep. It was therefore decided to attempt the removal of the stapes without tenotomy of the stapedius and without dividing the incudo-stapedial joint. By means of a hook passed behind the long process of the incus gentle traction was first made and the hearing then tested; when it was found that the hearing for the tuning-fork, by bone-conduction over the mastoid, had risen from zero to $\frac{1}{8}$. Still further traction was then made in the same manner, the result being extraction of the stapes from the niche and outflow of fluid and a rupture of the incudo-stapedial articulation, the stapes being carried upward and backward by the pull of the stapedius muscle, and the incus also disappearing in the same direction.

Immediately after the operation the tuning-fork was not heard aërially, but the hearing for the fork had increased to $\frac{3}{8}$ by bone-conduction over the mastoid.

In this case it should be remarked that, notwithstanding the apprehension of the patient as to pain during, and other possible effects after, the operation, neither the mobilization of the stapes nor its final removal from the niche was accompanied either by slowing of the pulse or by vertigo; and a report made six weeks later was to the effect that the ear was, to all intents and purposes so far as the patient's sensations were concerned both as to hearing and as to tinnitus aurium, which still persisted, precisely the same.

The following cases, briefly reported, include those belonging to a class for which some operative relief, if possible, would be most desirable; cases in which, as has been shown by Politzer, there is, in consequence of a chronic progressive, long-continued, non-suppurative middle-ear disease, a fixation of the stapes, on account of bony growth, to the extent

in some cases of a complete enclosure of the base plate and even of the crura also.

L. S., a man twenty-six years of age, had, especially in the right ear, a slowly progressive impairment of hearing dating back, so far as the first observation of it was concerned, to a severe coryza twelve years previously. The right membrana tympani was transparent, intact, and not indrawn. The Politzer acoumeter was heard at a distance of 4'; the tuning-fork (562 v. s.), aërially $\frac{5}{8}$, by bone-conduction $\frac{3}{8}$.

The operation, under cocaine, consisted in the usual incision, which was made without improvement in the hearing. The stapedius tendon and the articulation were divided without special discomfort to the patient, and a blunt hook passed under the stapes head and used with gentle traction resulted in a fracture of the crura midway of their length; with this fracture there was a sensation of a sharp snapping noise, but there was neither pain, vertigo, nor change in the pulse, and the hearing was not improved.

N. B., a woman, twenty-eight years of age, was a case of the same class as those previously reported. The hearing had been slowly decreasing for several years until the deficiency had become a serious inconvenience in the attempt at hearing anything but loud conversation. The left ear was the more seriously affected of the two, and it was therefore the one selected for operation. The membrana tympani was fairly transparent, intact, and the hearing for the Politzer acoumeter was 6', for the tuning-fork (562 v. s.), aërially $\frac{1}{8}$, and by bone-conduction over the mastoid $\frac{3}{8}$. The usual incision in the membrana tympani was made under cocaine without improvement in the hearing. The stapes was high up and far back and the stapedius tendon was probably only partially divided, as, following division of the articulation, the use of the blunt hook resulted in extraction of the stapes from the oval window and its loss from the hook by being pulled upward and backward. With the extraction of the stapes there was no apparent outflow of fluid, but there was pallor, quickened respiration, and slowing of the pulse. There was no improvement in the hearing, either immediately after the operation, which was concluded with the application of a paper dressing, or at subsequent tests.

M. A., a woman, forty years of age, with a history similar to that in the above two cases, and with marked impairment of hearing

in the left ear ; the tuning-fork aërially (562 v. s.) being heard less than $\frac{1}{8}$, and by bone-conduction over the mastoid $\frac{1}{4}$.

Following the usual peripheral cut under cocaine, a division of the stapedius tendon and of the incudo-stapedial articulation, an attempt at mobilization of the stapes showed that bone to be very firmly fixed, while a still further persistence to the extent of attempted extraction, resulted in a fracture of the anterior crus near the head and of the posterior crus near the foot-plate.

There was no vertigo and no slowing of the pulse, neither was there any gain in the hearing from the operation, but the patient experienced during its progress the usual sensations of rasping and grating noises, and of a sharp crack coincident with the stapes fracture.

The two following cases are selected as illustrating the fixation of the stapes, to the extent of absolute immobility, in the course of a chronic non-suppurative disease of the middle ear. In both of them had greater force been used, a fracture of the head of the stapes or of both crura at their upper portions would probably have resulted ; and in one of them it was even possible to slightly lift the partially recumbent head of the patient by means of the blunt hook inserted under the head of the stapes.

Mrs. F. K., forty-five years of age. In both ears the hearing was much impaired, but more especially in the left. The Politzer acoumeter was heard only close to the auricle, the voice at a distance of $\frac{1}{10}$, the tuning-fork (562 v. s.), aërially $\frac{1}{8}$, and by bone-conduction over the mastoid $\frac{1}{4}$. The Konigs rods were reported to be heard up to the tone of 35,000 v. s., but, notwithstanding repeated tests, there was some doubt as to the accuracy of the patient's statement.

The operation under cocaine consisted, after the peripheral cut in the membrana tympani, of division of the stapedius tendon and of the incudo-stapedial articulation. The stapes was found to be immovable even upon forcible traction with a blunt hook, and the opening in the membrana tympani was therefore closed and the paper dressing applied.

There was no slowing of the pulse, no vertigo, and no improvement in the hearing, but the patient reported a lessening of the tinnitus aurium, which had previously been marked in that ear, which improvement, however, did not persist.

Miss L. T., fifty years of age. Also a case of slowly progressive impairment of hearing in consequence of chronic non-suppurative disease of the middle ear.

As the right ear was the worse of the two, both in regard to hearing and an annoying tinnitus aurium, it was the one selected for the operation, which was in all respects similar to that in the preceding case, and terminated in an application of the paper dressing.

There was during the progress of the operation neither vertigo nor slowing of the pulse, nor was there any gain in hearing, which, as tested before the operation, was found to be for the tuning-fork (562 v. s.), aërially $\frac{5}{8}$, and by bone-conduction over the mastoid $\frac{3}{8}$. The Politzer acoumeter was not heard at all. There was no improvement in the tinnitus.

In reviewing the cases reported in this paper in the four numbers of this journal in which they have appeared, and also the tabular list which is here appended, it is very evident, so far as conclusions can be drawn from a small number of cases, that the operation of the removal of the stapes does not answer the purpose which might be hoped from it in cases of chronic non-suppurative disease of the middle ear. This conclusion is one in which the clinical and operative observations are entirely in accord with the pathology of this class of cases as set forth by numerous observers, and, lastly and most clearly, by Politzer. For all this class of cases, therefore, I should, as the expression of a personal opinion and as the result of experience, advise an exploratory tympanotomy with local and without general anæsthesia, as a preliminary to, or as the first part of, an operation having in view any form of interference with the middle ear, from simple mobilization of the ossicular chain to the removal of the stapes.

The exploratory tympanotomy, especially where the incision is made, as it should be, close to the periphery of the membrana tympani and of sufficient extent, affords an opportunity for a better determination of the condition of the middle ear in chronic non-suppurative disease than can be obtained in any other way, and after the exploratory incision, if it seems advisable not to operate more extensively, the opening in the membrana tympani can be closed by a

simple paper dressing with the prospect of speedy healing. If, however, the exploratory operation and coincident tests show that it is advisable to perform an operation in the middle ear, whether synæchtomy, tenotomy, incudectomy, incudo-stapedectomy, or stapedectomy, the opening suffices for the purpose.

In the great majority of the cases of stapes fixation, consequent upon chronic non-suppurative disease of the middle ear, the operation, as seen by the tabular statement, was ineffectual so far as the removal of the stapes was concerned, the fixation or the base plate at least being such as to result in fracture of the crura instead of the removal of the ossicle entire. In all the cases of non-suppurative disease in which the stapes was extracted entire, the hearing was definitely and practically improved in one only; and of the two other cases in which definite improvement in hearing resulted from the operation there was one in which the mobilization of the base plate incident to the fracture of the crura gave an improvement in hearing for high tones, and for the voice in ordinary conversation only to the extent of about twenty per cent.

When we take into consideration the secondary changes which may have occurred in the internal ear in the course of a non-suppurative disease of the tympanum and the injury to the delicate structures in the labyrinth which might result from the force exerted in the extraction of the stapes, coupled with the inadequate results as set forth in the experience here tabulated, it may be justly said that the operation of stapedectomy does not afford a promising outlook for this class of cases.

So far as the cases of fixation of the stapes incident to suppurative disease of the middle ear is concerned, we have, to begin with, to deal with a different pathological condition; the changes which have effected the fixation of the stapes are, in the majority of the suppurative cases, more superficial and more readily amenable to surgical treatment than in the chronic non-suppurative cases, and, while the extraction of the stapes has undoubtedly effected a considerable degree of improvement in some of the suppurative cases, it does

not at all follow that the same, or at least sufficiently satisfactory, results could not have been obtained by the minor operations effecting a mobilization of the stapes or of the ossicular chain as a whole, and consequently maintaining that mobile condition by artificial means.

The subject is one which is still open for investigation on other lines as well as on those here indicated, and it will be only as the result of a long series of carefully conducted comparative observations by different investigators that the value of the operation of removal of the stapes can be given its proper place in aural surgery.

TABULAR STATEMENT OF TWENTY-TWO CASES OF STAPES OPERATION.

CONDITION.	TESTS BEFORE OPERATION.	CHARACTER OF OPERATION.	CONCOMITANT SYMPTOMS AND INCIDENTS.	RESULTS AND REMARKS.
I.—R. o. m. c. adh. <i>Mt</i> transparent, intact.	P. ac. 2'. T. f. aer. $\frac{1}{8}$, on mastoid $\frac{3}{8}$. Voice 3'. Konig's rods 25,000 v. s.	November 5, 1892. Ether. Peripheral cut, incudo-stapedectomy, both bones allowed to remain in tympanum.	Slowing of pulse and pallor on extraction of stapes.	7 mos. later <i>Mt</i> reproduced, hearing stable. April 14, 1893. P. ac. 12' T. f. aer. $\frac{1}{8}$. Konig's rods 30,000 v. s.
II.—L. o. m. c. adh. <i>Mt</i> transparent, intact.	P. ac. o. T. f. aer. o, on mastoid slightly if at all. Voice loud close to head heard only not understood.	November, 1892. Ether. Peripheral cut, division of tendon and articulation, stapes removed entire.	Slowing of pulse, flow of fluid from niche, no vertigo for two days, then began, increased, became severe, lasted 10 days.	No gain in hearing, slight vertigo and unsteadiness in walking one month later.
III.—L. o. m. c. adh. Progressive 36 years. <i>Mt</i> slightly opaque, intact.	P. ac. 4'. T. f. aer. $\frac{1}{8}$, on mastoid questionable Konig's rods 20,000 v. s.	November 21, 1892. Ether. Peripheral cut, division of tendon and articulation, fracture of stapes, anterior crus close to foot-plate, posterior crus close to head, circumcision and attempt at removal.	No slowing of pulse until attempt to extract base plate, then also slight oozing of watery fluid. No vertigo.	December 5, 1892. P. ac. 5'. T. f. aer. $\frac{1}{8}$, on mastoid $\frac{3}{8}$. Konig's rods 25,000 v. s.
IV.—L. o. m. c. adh. with thick periph. <i>Mt</i> intact.	P. ac. c't. T. f. aer. $\frac{3}{8}$, on mastoid $\frac{3}{8}$. Galton's whistle o. Konig's rods 20,000 v. s. Voice c't., conversation tone.	November 23, 1892. Cocaine. Peripheral cut, division of tendon, and articulation, fracture of stapes, both crura close to foot-plate, paper dressing.	Attempt at circumcision and removal showed a bony ankylosis and foot-plate was left in place.	November 28, 1892. T. f. aer. $\frac{3}{8}$, on mastoid $\frac{3}{8}$, voice, low tones, clearly close to ear November 29th. Galton's whistle 50, and T. f. i. 2. heard L. (not before). February 4, 1893. T. f. aer. $\frac{1}{8}$, and for voice (temporary gain from mobilization of foot-plate).

CONDITION.	TESTS BEFORE OPERATION.	CHARACTER OF OPERATION.	CONCOMITANT SYMPTOMS AND INCIDENTS.	RESULTS AND REMARKS.
V.—L. o. m. c. adh. progressive, especially thick about stapes, <i>Mt</i> opaque, indrawn.	P. ac. 2'. T. f. aer. $\frac{1}{8}$, on mastoid $\frac{1}{8}$.	December 16, 1892. Cocaine. Peripheral cut, division of articulation but not of tendon, stapes extracted entire, paper dressing.	Suction sensation, slowing of pulse, transient vertigo, outflow of fluid from niche.	No appreciable gain in hearing.
VI.—R. eff. o. m. s. <i>Mt</i> destroyed, incus gone, stapes free from muscular or other attachment plainly visible.	P. ac. 0. T. f. aer. 0, on mastoid $\frac{1}{8}$.	December 30, 1892. No anæsthetic. Stapes extracted by gentle traction made with blunt hook.	Suction sensation, pallor, slowing of pulse, slight blush of tympanic mucous membrane followed by outflow of fluid and vertigo.	Gain for hearing at first very marked for voice, then variable, and then disappearing in the next ten days with the stoppage of the flow of the fluid and the subsidence of the vertigo.
VII.—R. o. m. c. adh. of long standing, <i>Mt</i> transparent intact.	P. ac. 1'. T. f. $\frac{1}{8}$, on mastoid $\frac{1}{8}$. Galton's whistle lower third only. Voice c't.	December 2, 1892. Cocaine. Peripheral cut, division of tendon, incudo-stapedectomy, paper dressing.	Slight vertigo, pulse increased (80-100) and became small.	No gain in hearing, subsequent decrease.
VIII.—L. o. m. c. adh. <i>Mt</i> transparent, intact.	P. ac. 0. T. f. aer. $\frac{1}{8}$, on mastoid $\frac{1}{8}$. Konig's rods 35,000 v. s.	January 13, 1893. Cocaine. Peripheral cut, division of articulation, but not of stapedius tendon, extraction of stapes, Paper dressing.	On extraction of stapes, sense of shock, slowing of pulse, no vertigo, no apparent fluid from niche.	May 18, 1893. P. ac. 0. T. f. aer. $\frac{1}{8}$, on mastoid $\frac{1}{8}$. Konig's rods 20,000 v. s. only.
IX.—L. o. m. c. adh. progressive, of long standing, local treatment ineffectual. <i>Mt</i> clear, intact.	P. ac. 0. T. f. aer. $\frac{1}{8}$, on mastoid questionable, or referred to R. Galton's whistle full limit, Konig's rods 30,000 v. s.	January 20, 1893. Cocaine. Peripheral cut, division of articulation, mobilization of stapes, then extraction of stapes entire, paper dressing.	On extraction of stapes from niche a loud subjective sound, no pain, no vertigo, slight outflow of fluid, immediate increase in hearing for all low tones which disappeared within 48 hours.	June 17, 1893. P. ac. 0. T. f. aer. $\frac{1}{8}$, on mastoid referred to R. Galton's whistle apparently at full limit and Konig's rods apparently up to 20,000 v. s. (Weber T. f. in front of aural line referred to L. back of line to R.)
X.—R. o. m. c. adh. <i>Mt</i> clear and transparent.	P. ac. c't. T. f. aer. $\frac{1}{8}$, on mastoid $\frac{1}{8}$.	January 26, 1893. Cocaine. Peripheral cut, division of tendon and articulation, fracture of cura at mid length, paper dressing.	Sound of a sharp crack on fracture of stapes, no slowing of pulse, no vertigo.	February 24, 1893. P. ac. 0. T. f. aer. $\frac{1}{8}$, on mastoid $\frac{1}{8}$. Voice with a metal trumpet as sharp as before the operation.

Removal of the Stapes.

413

CONDITION.	TESTS BEFORE OPERATION.	CHARACTER OF OPERATION.	CONCOMITANT SYMPTOMS AND INCIDENTS.	RESULTS AND REMARKS.
XI.—L. o. m. c. adh. <i>Mt</i> transparent, intact.	P.ac. c't. T.f. aër. $\frac{1}{8}$, on mastoid $\frac{3}{8}$.	February 9, 1893. Cocaine. Peripheral cut, division of articulation but not of stapedius tendon, fracture of both crura near base plate of stapes.	Fracture of crura, preceded by slight sense of suction resistance, and followed immediately by vertigo, unconsciousness and nausea, lasting over an hour, and a momentary change in the pulse, which became small and rapid (112).	February 27, 1893. P. ac. c't. T. f. aër. $\frac{3}{8}$, on mastoid $\frac{3}{8}$. Vertigo persists.
XII.—R. o. m. c. adh. posterior segment opaque and relaxed.	P.ac. o. T.f. aër. $\frac{1}{8}$, on mastoid $\frac{3}{8}$. Galton's whistle o.	March 30, 1893. Cocaine. Peripheral cut, division of articulation, fracture of both crura of stapes midway of length, paper dressing.	No pain, no vertigo, no change in pulse.	June 21, 1893. P. ac. o. T. f. aër. $\frac{3}{8}$, on mastoid $\frac{1}{8}$. No gain in hearing.
XIII.—B. o. m. c. adh. especially L. <i>Mt</i> clear, intact.	L. P.ac. o. T. f. aër. o, on mastoid o. Galton's whistle 30 only.	Cocaine. Peripheral cut, incudo-stapedectomy without division of articulation or tendon, paper dressing.	On extraction of stapes, slowing of pulse, no vertigo.	After opening of tympanum, T. f. aër. o, on mastoid $\frac{1}{8}$; after extraction of stapes, T. f. aër. o, on mastoid $\frac{3}{8}$; outflow of fluid from niche. No subsequent improvement.
XIV.—L. o. m. c. adh. <i>Mt</i> transparent, intact.	P.ac. c't. T.f. aër. o, on mastoid $\frac{3}{8}$.	Cocaine. Peripheral cut, division of tendon and articulation, stapes, anterior crus close to head, posterior crus close to base plate, paper dressing.	No vertigo, no slowing of pulse, but nausea and vomiting, apparently due to cocaine. No gain in hearing.	
XV.—L. o. m. c. adh. <i>Mt</i> transparent, intact.	P.ac. c't. T.f. aër. $\frac{1}{8}$, on mastoid $\frac{3}{8}$. Voice $\frac{1}{8}$. Konig's rods 35,000 v. s.	Cocaine. Peripheral cut, division of tendon and articulation, stapes immovable, paper dressing.	No slowing of pulse.	No improvement in hearing, and tinnitus, which was at first reported decreased, subsequently returned.
XVI.—R. o. m. c. adh. <i>Mt</i> clear.	March 6, 1893. P.ac. o. T.f. aër. $\frac{1}{8}$, on mastoid $\frac{3}{8}$.	Cocaine. Peripheral cut, division of muscle and articulation, stapes immovable, paper dressing.	No vertigo, no slowing of pulse.	No gain in hearing.

CONDITION.	TESTS BEFORE OPERATION.	CHARACTER OF OPERATION.	CONCOMITANT SYMPTOMS AND INCIDENTS.	RESULTS AND REMARKS.
XVII.—R. o. m. c. adh. <i>Mt</i> transparent, intact.	April 29, 1893. P.ac. 4'. T.f. aër. $\frac{5}{8}$, on mastoid $\frac{9}{8}$.	Cocaine. Peripheral cut, division of articulation and tendon, fracture of stapes both crura midway, paper dressing.	No pain, no vertigo, no change in pulse.	No gain in hearing.
XVIII.—L. o. c. m. c. <i>Mt</i> thickened and opaque.	May 20, 1893. P.ac. c't. T.f. aër. $\frac{1}{8}$, on mastoid $\frac{9}{8}$. Voice 2 ft. Galton's whistle 60, deep rushing tinnitus.	Cocaine. Peripheral cut, division of tendon and articulation, stapes removed entire.	On completion of cut, hearing improved and tinnitus ceased, but on removing stapes the hearing immediately fell to zero, and the tinnitus returned; within ten minutes vertigo began and increased, confining patient to bed twenty-four hours, then decreased, but has not entirely passed away. (Oct. 1st, 1893.)	June 26, 1893. Slight vertigo persists, no improvement in hearing or in tinnitus.
XIX.—L. o. m. c. adh. <i>Mt</i> transparent, intact.	May 30, 1893. P.ac. 6'. T.f. aër. $\frac{1}{8}$, on mastoid $\frac{9}{8}$.	Cocaine. Peripheral cut, division of articulation only, stapes extracted entire, paper dressing.	With extraction of stapes, pallor, quick respiration, slowing of pulse, no apparent outflow of fluid.	No improvement in hearing.
XX.—L. o. m. c. adh. <i>Mt</i> clear, intact.	June 8, 1893. P.ac. o. T. f. aër. $\frac{5}{8}$, on mastoid $\frac{1}{8}$.	Cocaine. Peripheral cut, division of tendon and articulation, fracture of stapes, anterior crus near head, posterior crus near foot-plate.	No vertigo, no slowing of pulse.	No gain in hearing.
XXI.—R. o. c. adh. <i>Mt</i> thick, retracted. Malleus immovable on inflation.		Cocaine. Peripheral cut, tensor tympani and stapedius cut, ossicular chain mobilized without improvement. Stapes broke on traction, leaving base plate firmly fixed, paper dressing.	No slowing of pulse, no nausea.	No improvement to hearing or to tinnitus.
XXII.—R. o. c. m. c. <i>Mt</i> thickened and retracted.	May 12, 1893. Watch 100. Voice $\frac{1}{8}$. T. f. aër. $\frac{5}{8}$, on mastoid $\frac{1}{8}$.	Cocaine. Peripheral cut. Hearing + for air, — for bone. Stapedius and joints severed, stapes circumcised. On traction crura broke, disappearing upward.	Vertigo, nausea, and vomiting. Ceased on going to bed. Suction resistance.	Hearing did not improve immediately. May 24th. Watch 100. Voice, $\frac{1}{8}$. T. f. aër. $\frac{5}{8}$, on mastoid, $\frac{1}{8}$.

REPORT ON THE PROGRESS OF OTOLOGY DURING THE SECOND HALF OF THE YEAR 1892.

NORMAL AND PATHOLOGICAL ANATOMY, HISTOLOGY, AND
PHYSIOLOGY OF THE EAR AND NASO-PHARYNX.

BY PROF. AD. BARTH, MARBURG.

Translated by Dr. MAX TOEPLITZ, New York.

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a.—ORGAN OF HEARING.

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8. BERTELLI, DANTE. Sulla membrana timpanica della rana esculenta. *Mon. zool. ital.*, Anno 3, No. 10, p. 203.

9. RICHARDS, H. A concluding report of the anatomy of the elephant's ear. *Trans. Amer. Otol. Society*, 1891, New Bradford, 1892, vol. v., p. i., p. 139.

10. HEATON, G. Remarks on congenital malformations of the auditory apparatus. *Fourn. of Laryngol.*, London, 1892, vol. vi., p. 147.

11. BÜKE. The morphological alterations of the auricle in normal, weak-minded, and idiotic individuals. Communication from Prof. Büke's aural department of the St. Rochus Hospital at Budapest. *Orvosi hetilap*, 1891, No. 7; and *Allg. Wien. med. Zeit.*, 1891, No. 11.

12. LANNOIS. The auricle in the normal individual. (Le pavillon de l'oreille chez les sujets sains.) Lyon, 1892.

13. VARIOT, G., and CHATELLIER. Congenital malformation of the left auricle in a child; imperforation of the external meatus. Operative attempt. (Malformation congénitale de l'oreille gauche chez un enfant; imperforation du conduit auditif externe. Tentative opératoire.) *Bull. de la soc. d'anthropologie de Paris*, série iv., t. ii., p. 652.

14. VARIOT, G., and CHATELLIER. A case of congenital malformation, and a case of anomaly of the auricle in children. (Un cas de malformation congénitale et un cas d'anomalie du pavillon de l'oreille chez des enfants.) *Ibid.*, p. 568.

15. WILHELM E. Material for anthropological studies of the auricle (continued). (Matériel pour servir à l'étude anthropologique du pavillon de l'oreille (suite.) *Rev. biol. du nord de la France*, Année iv., 1892, No. 7.

16. BOULLAND. The folds of the auricle from the standpoint of the identity. *Limousin méd.*, No. 10, 1892.

17. SCHÄFFER, O. The foetal development of the ear, the frequency of foetal forms of the ear in adults, and their hereditary relations. With two plates. *Arch. f. Anthropologie*, vol. xxi., 1892, p. 77.

18. DREYFUSS, R., Strassburg. Contribution to the anatomy and embryology of the middle ear and membrana tympani in man and mammals. (Preliminary communication.) (Contribution à l'anatomie et à l'embryologie de l'oreille moyenne et de la membrane tympanique chez l'homme et chez les mammifères (note préliminaire). *Arch. int. de laryngol.*, 1892, t. v.

19. BAUMGARTEN, HANS. Contribution to the embryology of the ossicles. Inaug. Dissertation, Berlin, 1892.

20. BIRMINGHAM, O. Some practical considerations on the anatomy of the mastoid region, with guides for operating. Read in the Section of Anatomie and Physiology, January, 1891, *Trans. of the R. Acad. of Med. in Ireland*, vol. ix., 1891.

21. NIEMACK, I., Goettingen. Contribution to the histology of aural polypi. Inaug. Dissert. and *Arch. f. Ohrenheilk.*, vol. xxxiv., p. 1. With two plates.

22. BEAUREGARD. Comparative anatomy of the inner ear. (Anatomie comparée de l'oreille interne.) Soc. de biol. *Progrès médic.*, June 25, 1892.

23. RETZIUS. The peripheric mode of termination of the acoustic nerve. *Verhandl. d. anat. Gesellsch.* at their sixth meeting at Vienna, 1892, p. 63.

24. RETZIUS. The mode of termination of the acoustic nerve. *Biol. Untersuchungen*, n. F. iii., p. 29. With two plates.

25. CHATIN, JOANNES. Corti's organ. *Compt. rend. hebdom. de la soc. de biol.*, série ix., t. iv., 1892, p. 565.

26. BUDDE, KARL. Déhiscences in the lower wall of the tympanic cavity. Inaug. Dissert., Goettingen, 1891.

27. SCHWABACH. Disturbances of hearing in meningitis cerebro-spinalis and their anatomical foundation. *Zeitsch. f. klin. Medicin*, vol. xviii., p. 273.

28. GEBERG, A. The termination of the acoustic nerve in the cochlea of mammals. (From the histolog. laboratory of Prof. Arnstein at Kasan.) *Anat. Anzeiger*, December 10, 1892, p. 20.

29. WAGENHÄUSER. Tübingen. Anatomical condition of the labyrinth in a case of deafness from leukæmia. *Arch. f. Ohrenheilk.*, vol. xxxiv., p. 219.

30. HABERMANN, J. Contribution to the knowledge of otitis interna. Second communication. *Graz. Zeitschr. f. Heilkunde*.

31. KIRILZEW, S. Contribution to the study of the origin and

central course of the acoustic nerve. Preliminary communication. *Neurolog. Centralbl.*, 1892, p. 669.

32. HELD, HANS. A direct acoustico-cortical path, and the origin of the anterior-lateral tract in man. From the Anat. Inst. at Leipsic. *Arch. Anat. und Entw.*, Jahrg. 1892, p. 257.

33. BECHTEREW. Striæ medullares sive acusticæ of the medulla oblongata. *Medizinskoje Obosvenje*, 1892, No. 5. (Russian.)

1. WICKERSHEIMER emphasizes the necessity of carefully dispensing his prescriptions for the attainment of good preparations. His fluid is composed of : Alum, 100 parts ; chloride of sodium, 25.0 ; nitrate of potassium, 12.0 ; impure carbonate of potassium, 6.00 ; arsenious acid, 20.0 ; water, 3000.0. To these different parts, which are successively dissolved in warm water, cooled off and filtered, four volumes of glycerine and one volume of methyl alcohol are added to each ten volumes. The methods of preservation, injection, and preparation should be studied from the original. For preservation in glycerine-gelatine, the following composition is recommended : White "French" gelatine of good quality is softened for an hour in distilled water, the excess of water poured off, the gelatine liquefied upon the water bath by two parts of chemically pure glycerine and the same part (by weight) of water, and then strained through a fine cloth. As tested alloys for metal corrosions are recommended : Plumbum, 32 ; stannium, 16 ; bismuth, 60 ; and cadmium, 12. These parts are in the same succession cautiously fused, the dross removed, and to the fluid metallic mixture ten parts of mercury are added.

2. Preserved and decalcified specimens can be made transparent to the thickness of about $\frac{3}{4}$ cm, when placed in xylol or oil of cloves and then in Canada balsam ; glycerine is suitable for smaller specimens. For preservation, small glass cases with plane parallel walls, and for inspection, glasses magnifying from four to five times, are recommended ; small objects should be examined with glasses magnifying from forty to fifty times.

4. The brief communication, referring to a difference of views from those of Retzius, forms a defence of the point of view of the authors.

11. The examination of 1,487 individuals, among whom were 1,000 normal persons, results in the fact that 26 per cent. of the normal men and 15 per cent. of the sound women have irregular auricles, and that this percentage is increased among the weak-

minded and idiotic persons to one half of the individuals. The anomalies were mostly found bilaterally, but preferably in the left auricle when unilateral.

18. This preliminary communication is more fully dwelt upon by the reviewer, since SCHWALBE has promised¹ a more elaborate paper upon the subject, to be published in the *Morphologische Jahrbücher*, edited by him. The malleus and incus originate from the I. visceral arch, and represent its proximal end. The rudiment of this termination continues in the direction of the stapedial ring. It is later transformed into foetal connective tissue. This rudiment has nothing in common with the lower process of the incus. There exists therefore a stage of development when the præchondral end of the I. visceral arch is situated at a certain distance from the stapedial ring. The handle of the malleus and the lower process of the incus develop simultaneously inward and downward from the I. visceral arch. The upper process of the incus develops later. The I. visceral arch, previous to its development, meets neither the capsule of the semicircular canals nor the primordial cranium. The stapedial ring is in the beginning freely situated in the mesodermal connective tissue, and is connected, but later, with the periosteal capsule. It develops from cells, which are grouped around a small vessel. It cannot be determined whether the stapes originates from the I. or II. visceral arch. In the præchondral capsule of the labyrinth the oval and round windows are rapidly differentiated. In the latter the præchondral tissue is directly transformed into connective tissue. In the oval windows of various animals direct transformation into connective tissue takes place, which disappears later on ; in others (in man) an intermediary stage of cartilage is found. Hence follows, that the labyrinthine capsule does not participate in the development of the stapedial plate. The annular ligament also develops from præchondral tissue, into which additional cells from the perichondrium of the tympanic cavity grow. The connection between the II. visceral arch and the capsule of the labyrinth, which was interrupted, for some time, by absorption, is later restored by insertion of tissue. The middle layer of the membrana tympani is a non-ossified portion of the tympanic ring. Rivini's incisura and Shrapnell's membrane indicate the place where the handle of the malleus had advanced from the upper part of the

¹ It has been published in the meantime, in German, with two plates. See *Morphol. Arbeiten*, by G. Schwalbe, vol. ii., No. 3 ; Gust. Fischer, Jena.—Moos.

tympanic cavity *in front* of the tissue proper of the membrana tympani. There exists no foramen Rivini (wrongly printed "incisura").

21. NIEMACK examined from the material of the aural polyclinic at Goettingen, 55 different aural polypi, among which he found: 5 fibro-epitheliomata; 10 granulation tumors; 3 angiomata; 16 angio-fibromata; 8 polypi with succulent tissue of which 5 were infiltrated with lymphoid, 3 with mucoid, parenchymatous fluid; 6 fibromata; 5 myxomata; 1 adenoma. It frequently occurs that erect cylindrical cells of the surface of polypi are transformed into horizontal, flat cells, but real metaplasia of cylindrical epithelia into pavement epithelia was not observed by the author. The capillaries are frequently filled with pus cells in the place of red corpuscles. Giant cells probably arise from proliferation of vascular endothelium. Blood pigment was frequently found, invariably in form of hæmosiderin. Hæmatoidin crystals were of rare occurrence. Polypi may lead secondarily to aural suppurations (?). Peculiar globules, which are stained by iodine a straw-yellow, not brown, and can be well distinguished from additional corpora amylacea, are considered as products of disintegration, closely allied to fibrin.

23. RETZIUS, according to investigations of the papilla basilaris of the cochlea of birds and mammals, has reached the conclusion that the hair cells of the epithelium are not directly connected with the nerve fibres of the acoustic, but are closely surrounded by them. These nerve fibres, however, represent peripheric processes of the bipolar ganglionic cells, which are imbedded in the acoustic and send their second process centrally toward the brain. These ganglionic cells are thus of the same value as the olfactory cells of the olfactory organ. They represent a higher stage of development of the cells of the sensory nerves, which are separated from the epithelium and displaced quite a distance toward the brain. The hair cells of the hearing organ, therefore, are no "nerve cells," but a kind of "indirect" sensory cells, which have entered secondarily the organisms of the organ of sense.

27. In consequence of cerebro-spinal meningitis, a female patient, aged thirty-two, had become entirely deaf in one ear, and partially for low tones in the other. Purulent infiltration, ecchymoses, and partial destruction of the acoustic were found. In the ear with better hearing-power the turns towards the base were

less changed than at the apex. The case furnished in one ear a positive contribution to Helmholtz' theory, and it demonstrated in the other, that in affections of the inner ear, the middle ear being intact, occasionally the usual relation of the perception of high and low notes may be reversed.

28. GEBERG injected a solution of methylene blue into the ascending aorta of narcotized animals, which he killed after 15 to 30 minutes. In the fresh organs of Corti the end fibrillæ of the acoustic were found to be attached to the hair cells, but not connected with them.

29. The petrous bones were derived from a person, æt. thirty-five, who had succumbed to lienal leukæmia. In either labyrinth hemorrhages and also new-formation of connective tissue and bone were found. External and middle ear were normal.

30. HABERMANN furnishes an additional contribution of two cases to the diseases of the inner ear. In one case he found purulent cerebro-spinal meningitis and bilateral purulent inflammation of the middle and inner ear of a child nine months old. In addition to the appearances of an old inflammation, which had run its course, those of a fresh one existed. The inner ear had suffered from a fibrino-purulent inflammation, principally in the perilymphatic space with partial transmission to the endolymphatic space. He believes according to the result of examination and the former investigations, that the inflammation has not been transmitted from the middle ear, but from the brain to the inner ear. In the second case the hearing organs were derived from a deaf-mute boy, who, in his fourth year of age, had been affected with otitis interna, which had caused his deafness. In the seventh year of age he died from morbilli with pneumonia. Apart from fresh changes of inferior importance defects in the nerves of the turn of the base and apex of the cochlea were found as symptoms of the former affection ; furthermore defects in the nerves and ganglionic cells of Rosenthal's canal, extreme alterations of Corti's organs and of the endosteal lining of the inner ear. Osseous occlusion of the aquæductus cochleæ and extreme extension of Reissner's membrane and of the sacculus rotundus were limited to one ear. The changes are to be considered partly as consequences of cerebro-spinal meningitis, partly as post-mortal alterations.

31. The investigations are conducted under the guidance of Dr. Darkschewitsch at Moscow and are not as yet concluded.

The results attained heretofore are given as follows: The inner and Deiters' nuclei do not serve as places of termination for the fibres of the acoustic, at least of its posterior root. The anterior nucleus and the tuberculum acusticum are primary centres of the posterior root of the acoustic. The upper olives also form one of the primary centres of the acoustic. The fibres of the acoustic which terminate in the upper olives take their course from the trunk of the acoustic into the corpus trapezoideum and are the fibres of the root, viz., they are not interrupted in their path by ganglionic cells. It has not been decided whether these fibres belong to the anterior or posterior root of the acoustic. The striæ acusticæ originate from the tuberculum acusticum and take their course to the upper olive of the other side. The greater portion then runs with the lower lemniscus to the posterior portion of the lower bigeminum. A small portion runs also to the olive and bigeminum of the same side.

b.—NASO-PHARYNX.

1. WILDER, HARRIS H. The nasal region of *menopoma alleghaniense* and *amphioma tridactylum*, with remarks upon the morphology of the ramus ophthalmicus profundus trigemini. From the Anatom. Instit. at Freiburg. With two plates. *Zoöl. Jahrb. Abth. f. Anat.*, vol. v., 1892, p. 155.
2. ZUCKERKANDL. The development of the ethmoid bone. *Verhandl. der Anat. Ges. of Vienna*, June, 1892, p. 291.
3. BRUNN, A. VON. Contributions to the microscopical anatomy of the human nasal cavity. *Arch. f. microscop. Anat.*, vol. xxxix, No. 4.
4. RETZIUS, G. The mode of termination of the olfactory nerve. *Biol. Untersuchungen*, n. f. iii, p. 25. With one plate.
5. PREOBRASCHENSKY, S. Contributions to the study of the development of the olfactory organ in the chick. With one plate. *Mittheil. aus d. embryol. Inst. d. Univ. Wien*, No. xii., zweite Folge, No. v., 1892.
6. MERKEL, FR. Jacobson's organ and papilla palatina in man. *Anatom. Hefte*, vol. i., part 1, 1892, p. 215.
7. BRUNN, A. VON. The termination of the olfactory fibres in Jacobson's organ in the sheep. *Arch. f. microscop. Anat.*, vol. xxxix., No. 4.

8. LENHOSSÉK, M. VON. The nerve origins and terminations in Jacobson's organ in the rabbit. *Bdle Anat. Anzeiger*, 1892, Nos. 19 and 20.

9. SLUITER. Jacobson's organ in the crocodilus porosus. *Amsterdamer Anat. Anzeiger*, 1892, p. 540.

10. CHIARUGI, GIULIO. Sullo sviluppo del nervo olfattivo nella *Lacerta muralis*. *Mon. Zool. ital.*, Ann. 3, No. 10, p. 211.

11. CORNIL, C. Results attained by Golgi's method applied to the study of the olfactory bulb. (Des résultats obtenus par la méthode de Golgi appliqué à l'étude du bulbe olfactif.) *Mém. de la soc. de biol.*, série ix., tome iv., 1892, p. 179.

12. CHOLEWA. The feasibility of probing the frontal sinuses. *Berlin. Monatsschr. f. Ohrenheilk.*, etc., 1892, Nos. 8 and 9.

13. HOCHSTETTER. The formation of the primitive posterior nares in man. *Verhandl. der Anat. Ges. zu Wien*, June, 1892, p. 181.

14. RÉTHI, L. The nerve roots of the muscles of the pharynx and palate. F. Tempsky, Vienna. *Sitz. Ber. d. Kais. Ac. d. Wiss.*, vol. ci., p. 622.

15. NORTH. Physiology and pathological anatomy of the oral tonsils. *Fourn. of the Amer. Med. Ass.*, October 15, 1892.

16. ROMANE. Physiological and bacteriological study of the tonsil. (Étude physiologique et bactériologique de l'amygdale.) *Thesis*, Paris, 1892.

2. In the second foetal month the first rudiment of the ethmoid bone is quite smooth upon the surface, and the ethmoid conchæ, the processus uncinatus, and the bulla ethmoidalis are still absent. In the third month the nasal surface of the ethmoid tubercle exhibits a deep furrow (fissura ethmoidalis inferior), which indicates the division into two ethmoid conchæ. At the turning-point of the maxillo-turbinal into the nasal capsule a ridge of the mucous membrane projects against the middle meatus, representing the first rudiment of the processus uncinatus. In the fourth month the ethmoid conchæ present nearly their definite form. (Cp. for additional facts these ARCHIVES (German edition), vol. xxiii., p. 279, No. 8.)

8. The author describes the cells and nerve terminations in Jacobson's organ, as represented by the preparation according to Golgi's method in an embryo of the rabbit, 30 mm long. These investigations are essentially in accordance with those of Brunn.

There exist supporting and olfactory cells, but a double relation with reference to innervation, viz., sensory fibres, and also terminal fibres, the latter like those first described by Cajal. It cannot be ascertained whether the latter originate from the olfactory or trigeminus, since both views can be supported.

9. SLUITER could demonstrate that in a stage of development, preceding the rapid elongation of the snout, Jacobson's organ is well developed. It undergoes later retrogressive changes. It could not be ascertained from his material which cavity at the roof of the oral cavity, found at later stages, corresponds to that organ.

12. CHOLEWA, after an examination of more than a hundred specimens, arrives at the conclusion, that probing of the frontal sinus is impracticable in about 20 per cent. on account of projection of the ethmoid cells, in further 20 per cent. by the formation of the middle turbinated bone, but practicable in about 60 per cent.

13. Examinations of three human embryos, 7.0, 11.0, and 15.5 *mm* long, resulted in the fact that the formation of the primitive choana in man, similar to that in the cat and rabbit, occurs by the perforation of the nasal cavity toward the oral cavity. The statements of the authors of a fissure connecting the nasal and oral cavities, which is said to exist at a distinct period of development, and of which the primitive choana is said to be preserved as remnant, the so-called nasal furrow or sulcus, do not agree with the facts.

B.—PHYSIOLOGY.

a.—HEARING ORGAN.

1. LANGE, VICTOR, Copenhagen. Can the microphone be advantageously used for the construction of an apparatus for the improvement of hearing? *Deutsche med. Wochenschr.*, 1892, No. 15.

2. OSTMANN, Koenigsberg. The importance of the incisuræ Santorini as protective arrangements. *Arch. f. Ohrenheilk.*, vol. xxxiii., p. 161.

3. OSTMANN, Koenigsberg. The value of the panniculus adiposus of the lateral wall of the tube. A contribution to the study of autophony. *Arch. f. Ohrenheilk.*, vol. xxxiv., p. 170.

4. MILLET. Colored hearing (audition colorée). Paris, O. Doin, 1892.

5. BEAUREGARD. The rôle played by the round window (rôle de la fenêtre ronde). Soc. de biol. *Tribune méd.*, June 23, 1892.

6. OSTMANN. Protective arrangements in the labyrinth against increase of pressure. Verein f. wissenschaftl. Heilkunde at Königsberg. Meeting of January 11, 1892. *Deutsche med. Wochenschr.*, 1892, p. 593.

7. OSTMANN, Königsberg. Pressure and increase of pressure in the labyrinth. *Arch. f. Ohrenheilk.*, vol. xxxiv., p. 35.

8. URBANTSCHITSCH, V., Vienna. The influence of weak impulses of sound upon the increment of acoustic sensation. *Arch. f. Ohrenheilk.*, vol. xxx., p. 186.

9. GIRARD. Investigations upon the function of the semi-circular canals of the inner ear in the frog (recherches sur la fonction des canaux semi-circulaires de l'oreille interne chez la grenouille). *Arch. de Physiol.*, April, 1892.

10. CHARLESK. The localization of the hearing centre. *Brain*, 1892, p. 465.

1. VICTOR LANGE, on account of many experiments, has reached the conclusion that the microphone does not intensify but only transmits the sound. He has constructed a portable microphone, which acted well upon normal persons. Deaf patients without exception passed an unfavorable judgment upon it. The hearing was not improved by the apparatus.

2. According to OSTMANN the incisuræ Santorini act like hinges, so as to enable a displacement in direct action of trauma, without occurrence of injuries.

3. OSTMANN discusses the heretofore unsatisfactory attempts at explaining the phenomenon of autophony in extremely emaciated individuals. He examined for this purpose two cases of tubes of normally nourished, and also two of extremely emaciated persons. In the former deposits of fat were found principally upon the lateral wall, to a lesser extent also upon the medial wall of the tubes, which in the emaciated specimens were reduced to a minimum. He demonstrates that, under these circumstances, the agents attending to keep the tube open readily preponderate, so as to keep apart the walls of the cartilaginous tube at their narrowest place. The fatty cushion of the lateral wall of the tube thus forms a protective arrangement for the middle ear. Energetic action of the muscles of the tubes, principally that of

the musculus dilatator tubæ, and also its direct connection with the lateral membranous wall, is conducive to temporary opening of the tubes, which is not produced by paralysis of the openers of the tubes, as it has been heretofore frequently assumed.

7. The experiments made with interpolated elastic small sacs upon communicating tubes, arranged in a certain manner, led to the following result: 1. If the endolymph were under higher pressure than the perilymph, this excess should be borne by elastic tension of the walls of the membranous labyrinth. This tension would be extremely unsuitable for the transmission of sound upon Corti's organ. 2. It is to be assumed that the perilymph and endolymph bear the same pressure, which is somewhat lower than the intracranial pressure. 3. The fluctuations of pressure of the liquor cerebro-spinalis due to respiration and pulse are not transmitted to the labyrinth. 4. Eventual escape of perilymph and endolymph, with increase of pressure in the labyrinth by excessive vibrations of sound, occurs simultaneously. 5. The protective arrangements of the labyrinth prevent depression of the vestibular membrane and consequential injury to Corti's organ with increased intracranial pressure. 6. The loss of the high notes in injuries to the nervous end apparatus of the acoustic by excessive vibrations of sound, can be explained by prolonged and intensified action of pressure of the endolymph upon the structures situated in the first cochlear turn and upon the nerve fibres in Corti's organ.

8. From well known cases in literature, and from his own various experiments made upon individuals with normal and decreased acuteness of hearing, decreased by different causes, with reference to the faculty of hearing extremely varying modes of sound with simultaneous action of a sound or tone upon the ear experimented upon, URBANTSCHITSCH arrives at the conclusion that an improvement of hearing in a noise depends upon an increase of the acoustic threshold sensation, and that it is quite questionable whether the conducting apparatus participates in this phenomenon.

b.—NASO-PHARYNX.

1. FÉRE, M. CH., BATIGNE, P., and OUVÉY, P. Investigations upon the minimum of smell and taste perceptible in epileptics. *Mémoire présenté à la soc. de biol.* Meeting of July 30, 1892. (Reviewed in *Neurol. Centralbl.*, 1893, p. 20.)

1. Sixty-six per cent. of 115 epileptics examined were found with decreased sensation of smell. Remedies applied for epilepsy had no influence upon the sensation of smell. Bromide of potassium was injurious, when otherwise not well borne either. Loss of taste was found in two cases, decrease in 65 per cent.

C.—PATHOLOGY AND THERAPEUTICS.

BY DR. ARTHUR HARTMANN, BERLIN.

Translated by Dr. MAX TOEPLITZ, New York.

GENERAL LITERATURE.

1. KOELIN, J. M. Statistical contributions to aural diseases. Dissertation, Zurich, 1892.
2. NIMIER. Contribution to the study of the geographical distribution of aural diseases in France. *Annal. des malad. de l'oreille*, No. 10, 1892.
3. WHITEWELL, R. X. Observations made in India. *Indian Med. Gazette*, August, 1892.
4. TSAKYROGLOUS, M., Smyrna. From my practice: Etiological contributions to aural diseases. *Monatsschr. f. Ohrenheilk.*, No. 7, 1892.
5. LICHTENBERG, ROMEL, Budapest. Disturbances of hearing of railroad employees with reference to the safety of the travelling public. *Monatsschr. f. Ohrenheilk.*, etc., Nos. 11 and 12, 1892.
6. SCARAMCYZA. Aural affections in influenza. *Il sordomuto*, 1892.
7. AIROLDI. Aural affections in cerebro-spinal meningitis. *Ibid.*
8. VALLI. Otitis interna in late hereditary syphilis. *Ibid.*
9. GRAZZI, Florence. Epidemic parotitis as a cause of deafness. The education of deaf-mutes. *Bolletino delle mal. dell' orecchio.*, etc., Feb., 1892.
10. Prof. URBANTSCHITSCH. The mutual relations between both hearing organs. *Wiener klin. Wochenschr.*, No. 46, 1892.
11. GELLÉ. Symptomatic value of the reflex of binaural accommodation. *Soc. de biologie*, March 14, 1892.
12. STAMOFF, Z. Clinical investigation on electric vertigo in aural affections. Dissert., Geneva, 1892.

13. HOLANOFF, P. S. Clinical studies on paracusis Willisii. Dissert., Geneva, 1892.

14. POLLAK, Vienna. Contribution to the treatment of subjective sensations of hearing. *Zeitschr. f. Therapie*, August, 1892.

15. LUBET-BARBON, Paris. The use of bromethyl as an anæsthetic. *Revue de laryngologie*, etc., No. 16, 1892.

16. STETTER. Polypoid growths in the external meatus, due to sarcoma of the cranial base. *Arch. f. Ohrenheilk.*, vol. xxxiv., p. 54.

17. ROHRER. Further experiments upon the antimycotic action of aniline dyes. *Arch. f. Ohrenheilk.*, vol. xxxiv., p. 226.

18. UCHERMANN, V., Christiania. Sudden deafness in otitis media. *Nord. mag. f. Læger*, No. 6, 1892.

19. GRADENIGO, Prof., Turin. The prophylaxis of deaf-mutism. *Il Sordomuto*, Supplement to Nos. 3 and 4, 1892.

20. GELLÉ. Result of anatomical examination of a deaf-mute woman. *Il Sordomuto*, 1892, p. 231.

21. DE ROSSI, Prof. The necessity of special physicians for the treatment of the ear, eye, and larynx in institutions for the deaf-mute. *Archivio Ital. di otologia*, etc., vol. i., No. 4.

1. KOELIN has used the material of Rohrer at Zurich (4,768 cases during the years 1886 to 1890) for his statistics, which are in entire accordance with those of the authors referred to. It is, however, to be regretted, that the main table (II.) presents such an arrangement of the forms of diseases as to render its scientific importance uncertain. SIEBENMANN (Bâle).

2. NIMIER's tables show the proportion of the enrolled men of the different departments who, exempted from service or assigned to the reserves, were found with changes in the hearing organ among 10,000 examined persons. The tables were made according to the report of the revising councillors of the years 1887 to 1890. We infer from these reports that the average number is 55 to 10,000, that this is exceeded in 44 departments, in one (Charente) by the treblé amount, in three (Manche, Nièvre, Côte du Nord) by more than the double figure. From the appended maps, one is astonished to find that the least affected department is situated south of the degree of latitude through the mouth of the Loire. Other tables present the distribution according to climate and race. GELLÉ (Paris).

3. From observations made in India WHITEWELL has come to

the conclusion, that post-nasal growths and their attendant complications are very common among the natives. It appears, therefore, that these troubles are by no means the result of advanced civilization or intellectual development.

4. According to the experience of TSAKYROGLOUS, nearly all divers for sponges are hard of hearing or deaf. They jump with a heavy marble into the sea to a depth of thirty fathoms, and suffer, by the rapidly increasing water pressure, from ruptures of the membrana tympani with consecutive inflammations and suppurations. In opposition to influenza, dengue fever rarely produces aural affections; this holds also good of malaria. In lepra the posterior surfaces of the auricles become anæsthetic at an early stage and present the formation of nodules.

G. KILLIAN (Freiburg).

5. Among 250 train employees LICHTENBERG found 14 with chronic catarrh of the middle ear, 3 with otorrhœa, 1 with otitis media acuta, 1 with hyperæsthesia of the acoustic nerve, 3 with affections of the labyrinth, 1 with hyperostosis of the external meatus, 4 with anomalies of tension of the membrana tympani, 1 with extreme scaling in the external meatus, 36 with ceruminal plugs, 5 with "organized infiltrations" of the membrana tympani, 5 with cicatrices of the drum-membrane, 4 with "dry defects of the membrane," and 1 with circumscribed atrophy of the drum-membrane. He emphasizes the frequency of the catarrhal affections of the ear (32) against the scantiness of affections of the labyrinth (3 cases), and also the frequency of ceruminal plugs (36 cases), which did not occlude the ear in all cases. Of the 32 catarrhal affections about 20 were acquired during active service, 12 of which had led to considerable deafness. Lichtenberg does not consider an average acuteness of hearing as sufficient to prevent all dangers of the service, and demands an exact otological examination of the employees for admission, and also one every other year after the admission into service.

G. KILLIAN.

6. SCARAMCYZA, after an extensive bibliography, briefly describes the observations made at the otological polyclinic at Turin. The number of affected men was twice as large as that of the women; the ages of from 20 to 40 were most frequently concerned. Thirty-five cases of catarrhal (19 bilateral) and 41 of purulent (7 bilateral) inflammations of the middle ear occurred. In 10 cases chiselling of the mastoid process was necessary. Two

cases of affection of the labyrinth were observed, a primary and a secondary case with otitis media. GRADENIGO.

7. AIROLDI reports seven cases of aural disease in cerebro-spinal meningitis. GRADENIGO.

8. VALLI observed nine cases of otitis interna in hereditary syphilis. GRADENIGO.

9. GRAZZI reports two additional cases of deafness from parotitis epidemica. In the first case, concerning a boy, æt. twelve, with parotitis prevalent in the right side, deafness, tinnitus, and vertigo occurred in convalescence. Vertigo disappeared later, but complete deafness remained in the right ear; conversation was perceived in the left ear at a near distance. Treatment was unsuccessful. The second case occurred in a girl, æt. seventeen, with severe parotitis; complete deafness took place in the right ear without tinnitus and vertigo. Treatment was also without avail. GRADENIGO.

10. URBANTSCHITSCH distinguishes homogeneous and heterogeneous mutual relations between the two hearing organs. The former consist of phenomena of the same character in both ears, as *e.g.*, disturbances of hearing in one ear followed by the same in the other; the latter consist of phenomena of different character in one ear produced by those in the other. Homogeneous mutual effects may be of vasomotor (in severance of the sympathetic and in pinching of the auricle), trophic (sympathetic, alternating inflammations), sensory (in neuralgia or other sensations of pain) or functional character. Urbantschitsch observed heterogeneous mutual relations quite markedly in probing the Eustachian tubes. Inflammation of one ear frequently diminishes the function of the other. The extremely practical importance of these relations may be recognized from: 1, the increased acoustic excitation in binaural hearing; 2, the increased therapeutic effect of bilateral treatment; and 3, the favorable influence, which may be exerted by operative interference with the conducting apparatus of one upon the other ear, principally by removal of injurious influence of accommodation.

11. According to GELLÉ's examinations, a slight pressure upon the membrana tympani of a normal ear may influence the hearing power of the opposite one. This reflex disappears or may disappear in the course of cervical pachymeningitis. The reflex is preserved in hysterical unilateral deafness and also in various cerebral disturbances. It disappears invariably, if the disturbances

of the conducting apparatus originate from the acoustic and the medulla oblongata.

12. In conjunction with Wyss, director of the oto-laryngological clinic of the university at Geneva, STAMOFF applied to 130 hearing organs the constant current in order to produce electric vertigo. He found, that in the majority of acute affections of the middle ear, a much weaker current was required for the production of vertigo than in the normal ear. Electric sensation of sound does not occur, a few cases excepted, in those patients, in whom the constant current causes vertigo ; inversely the vertiginous phenomena are usually missing, when ringing is caused by the current. SIEBENMANN.

13. The paper written under the guidance of Wyss contains the histories and examinations of 26 deaf persons affected with paracusis Willisii. The functional examination points in most cases to the existence of an affection of the middle ear, and, therefore, in all 26 cases Galton's whistle was better perceived through the hearing tube than without it. In some patients the alleged paracusis was examined experimentally, viz., during a ride in the railroad car or during the roar of drums, tambourine, etc., the human voice (conversation) was used for examination. Marked improvement was noticed only in intense noises and with concussions of the body. SIEBENMANN.

14. POLLAK recommends in cases with reaction of the acoustic nerve in currents of medium strength (6 to 8 milliampères), systematic treatment of the subjective noises. He reports favorable results, but without influence of galvanization upon the hearing power. We refer the reader to the original for the method.

I. POLLAK (Vienna).

15. LUBET-BARBON recommends the use of bromethyl for the operation of adenoid vegetations, aural polypi in unmanageable children, and of thickenings of the septum in the region of the posterior extremities of the turbinated bodies, although these operations last longer than the action of the drug ; furthermore in extraction of the ossicles and curetting of the tympanic cavity. He has operated in three years on more than 1000 patients in this manner without injury to the patient. BOK (Berlin).

16. The patient was admitted on account of otitis media purulenta with granulations, paralysis of the left acoustic nerve, paralysis of the left vocal cord and of the œsophagus. During the subsequent weeks facial paralysis of the left side and weak-

ness of the left arm were added. STETTER, on account of pains below the left mastoid process, opened the left occipital fossa, assuming an intracranial progressing inflammation. Pus was not found, but dark, venous blood discharged after incision of the dura mater. The operation did not retard the disease. Successively, paresis of the left abducens, choked disk, exitus letalis occurred without fever or decrease of mental faculties. The post-mortem revealed extensive destruction of the base of the skull upon the left boundary line of the large occipital foramen, of the left half of the clivus Blumenbachii and of the medial and basal half of the petrous portion of the left temporal bone. The destruction comprised particularly the foramen spinosum, the meatus auditor. intern., the foramen jugulare, and the foramen condyl. anterius. RUMLER (Berlin).

17. Threads of silk imbued with anthrax and impregnated with a solution of one per thousand of hexa-ethyl pyoctanin produced neither directly nor after washing, a development of anthrax cultures. Inoculations upon mice gave also negative results. Solutions of one per cent. of auramin could not destroy the vitality of anthrax spores in 48 hours, but solutions of methyl and ethyl pyoctanin destroyed it. ROHRER used pyoctanin in substance successfully in aural and nasal eczema and in chronic offensive suppurations of the tympanic cavity, but in powders of two per cent. in the nose and larynx. He considers it more efficacious than methylene blue, recommended by Bresgen. The new antiseptic, oxychinaseptol (diaphtherin) was found to be very useful. It was applied to the ear in solutions of one per cent., to the nose in those of 0.1 to 0.2 per cent. RUMLER.

18. UCHERMANN presents a boy, age fifteen, who after bilateral, purulent, non-treated otitis media (post scarlatinam) suddenly became completely deaf. Two hours subsequently he was admitted to the clinic. In one ear the promontory was denuded of mucous membrane, in both ears extreme swelling of the mucous membrane; no ossicles. The left side presented facial paralysis. Injections of pilocarpine were tried for treatment, but without avail. The boy was referred to an institution for deaf-mutes. UCHERMANN.

19. GRADENIGO points out many erroneous statements in the Italian statistics on deaf-mutism in the year 1887. GRADENIGO.

20. Among the most important alterations found by GELLÉ at

the autopsy of a deaf-mute person, there were anchylosis in the oval window, atrophy of the nervous elements of the labyrinth and atrophy of the acoustic nerve, the facial being normal. (Microscopical examination does not appear to have been made.)

GRADENIGO.

21. DE ROSSI draws inferences from a series of investigations upon the relations of the ear and nose in deaf-mutes. He demands periodical otological examinations and treatment of the inmates of the institutions for deaf-mutes.

GRADENIGO.

INSTRUMENTS AND METHODS OF EXAMINATION.

22. Prof. BEZOLD. A continuous series of tones as a method of examination for the hearing power. *Munch. med. Wochenschr.*, 1892, No. 33.

23. BING, Vienna. Contribution to the study of bone-conduction through the head. *Wiener med. Blätter*, 1892, Nos. 31 and 32.

24. ZWAARDEMAKER. Sharpness of hearing (Gehoorscherpfe). *Med. Tijdschrift voor Geneeskunde*, 1892, No. 6.

25. DAVIDSOHN, H. Electric transillumination of the face as a positive means of diagnosis of empyema antri Highmori, with reference to the form of the hard palate. *Berl. klin. Wochenschr.*, 1892, Nos. 27 and 28.

26. ZIEM. Contribution to the transillumination of the facial bones. *Berl. klin. Wochenschr.*, 1892, No. 33.

27. JACKSON CHEVALLIER. A practical illuminator. *N. Y. Medical Record*, October 29, 1892.

28. JACKSON, CHEVALLIER. Some galvano-cautery electrodes. *N. Y. Med. Four.*, Nov. 12, 1892.

29. ZIEM, Danzig. The palpation of the upper and lower pharyngeal cavity and of the larynx. *Therap. Monatsh.*, Aug., 1892.

30. SCHÜTZ, Mannheim. A pharyngeal tonsillotome. *Munch. med. Wochenschr.*, 1892, No. 40.

31. WHITING, FRED. A new Eustachian electrode. *N. Y. Med. Four.*, Dec. 10, 1892.

32. MYLES, ROBERT C. Accessory sinus irrigation tubes. *N. Y. Med. Rec.*, Nov. 19, 1892.

33. DUNN, JOHN. A modified Hartmann's snare; some remarks upon its use. *N. Y. Med. Rec.*, Sept. 24, 1892.

34. DUNOTT, THOMAS J. A self-retaining mouth gag. *N. Y. Med. Four.*, Nov. 12, 1892.

35. GRIFFIN, HARRISON. An anatomical spatula. *N. Y. Med. Four.*, Sept. 24, 1892.

36. RAYNOR, F. C. A new uvulotome. *N. Y. Med. Four.*, Oct. 8, 1892.

37. MUNGER, CARL E. A modified Gottstein's curette. *N. Y. Med. Rec.*, Sept. 3, 1892.

38. DUNN, JOHN. A pair of post-nasal scissors. *N. Y. Med. Four.*, Nov. 26, 1892.

39. GIBBONS, PETER J. The treatment of nasal stenosis by means of a new intranasal tube. *N. Y. Med. Four.*, July 9, 1892.

22. Lecture with demonstration in the Society for Physiology and Morphology at Munic. BEZOLD succeeded in supplementing his well-known tona series in the lower region by a tuning-fork, manageable by the hand, which allows him to supplement the tones of from 30 to 16 vibrations—by increasing and displacing the weights; for the majority of persons with normal hearing the lower limit is thus reached. With reference to the results of examinations, Bezold mentions that the interstices of tone, which are thereby demonstrable, are mostly found at the upper and lower end, not unfrequently in the continuity of the series; that, on the other hand, in deaf and deaf-mute persons, circumscribed places—called islands by Bezold—exist with preserved perceptibility. What changes cause these partial defects, a large number of autopsies, preceded by exact examinations of the living, shall reveal. A considerable portion of these cases and also the islands, at any rate, can be localized with great probability in the labyrinth. Two deaf-mutes with such islands are presented. MÜLLER (Stuttgart).

23. BING sums up his observations as follows: The vibrations of a source of sound (watch, tuning-fork) in contact with the bones of the head, pass the bones in form of condensed and rarified waves directly to the interior of the labyrinth, and are perceived if they are sufficiently intense and if the perceptibility of the nervous hearing apparatus corresponds with it. This perception of sound is transferred directly through the bones of the head without interference of the structures of the tympanic cavity, as it has been clinically demonstrated in many cases. A

participation of the tympanic apparatus is not only unnecessary, but, on account of the contradiction of the pertinent phenomena, rather questionable. The transference of vibrations from the bones of the head to the ossicles does not take place. Conduction through the bones of the head and through the tympanic apparatus differ essentially from each other. POLLAK.

24. ZWAARDEMAKER, after an elaborate consideration of the value of the whispered speech for the determination of acuteness of hearing, explains the various instruments devised for this purpose. He sums up as follows: 1. Examine the acuteness of hearing with the whisper and express the result in a fraction, the numerator of which expresses the number of metres at which the patient perceives the whisper, and the denominator the number of metres at which the normal ear perceived it. 2. The sense of musical sound is examined with the largest possible number of the tonic scale. For a preliminary information, C, C², and *f* major ⁴ are sufficient; for complete examination, C, c, c¹, c², c³, c⁴, c⁵ are to be recommended. 3. The sensation of sound is either expressed by percentages of the normal hearing time, or, better, by physical measures, viz., by micro-millimetres of the amplitude which gives the impression of sound. 4. If the examination with tuning-forks takes up too much time, determine the sensation of sound at least as to *one* place in the first zone of the hearing line. POSTHUMUS MENYJES.

25. DAVIDSOHN uses the fact that the eyes of a patient are surrounded by a dark ring and reflect a fiery red glow when transilluminated from the mouth by an electric lamp, for diagnosis of empyema antri Highmori, by asserting that "the transillumination of the eye positively excludes the presence of pus under all circumstances, even in small quantity." From the fact that the eye remains dark, the presence of pus in the antrum cannot be inferred, "since also in highly arched hard palates and in steeply declining lateral parts of the alveolar process, the transillumination had invariably a negative result." RUMLER.

26. ZIEM briefly argues against Davidsohn's paper by demonstrating, on account of a drawing made by Zuckerkandl, that the eye might glow in spite of pus in the maxillary cavity. RUMLER.

27. The apparatus consists of a German-silver lamp-box, silvered within and blackened without, containing a fifty candle-power incandescent lamp. A silvered glass rod, the silvering

being protected by enamel, passes through an asbestos cork fitted into a lateral metal neck. The brilliant light of the box is transmitted axially through the rod. The box is attached by the "attachment plug" to the socket of any incandescent lamp after removal of the latter.

MAX TOEPLITZ.

28. The electrodes differ from the ordinary ones in the manner of their insulation, dispensing with the thread winding, and substituting hard rubber "vulcanized on" to the conducting wire. Reviewer does not agree with the author's views that the electrodes with thread winding are not well insulated and too bulky, which is certainly not the case with Schech's instruments, but he agrees that the vulcanized ones can be more readily sterilized.

MAX TOEPLITZ.

29. I. Palpation of the naso-pharyngeal cavity ought to be made before inspection, because it suffices in about four-fifths of all cases for diagnosis and it renders superfluous the tedious and circumstantial examination with the mirror and essentially facilitates surgical procedures in this region. Palpation is said to be less disagreeable to the patient than rhinoscopia posterior if properly made, viz., if violent manipulations are avoided (for this purpose either deep inspirations are made through the widely opened mouth (Schwarze), or pronunciations of the French "on" (Voltolini), or swallowing with somewhat closed mouth (Ziem). II. Palpation of the lower pharyngeal cavity (pars oralis + pars laryngealis, thus being designated by Ziem), is important for the diagnosis of œdema glottidis, tumors (lingual tonsil, retropharyngeal tumors), and foreign bodies. III. Palpation of the laryngeal cavity should be practised for intubation. The author deems it also possible to place the snare around laryngeal tumors situated in the upper part of the larynx under the guidance of the finger.

ZARNIKO (Hamburg).

30. The instrument is constructed on the principle of Fahrenstock's tonsillotome, the knife running in a curve (*cf.* illustration). SCHÜTZ has succeeded in wellnigh all cases, in attaining thereby thorough extirpation by a single cutting. Furthermore a so-called compressor is demonstrated which supersedes plugging. It is formed by a metal plate of the form and size of the naso-pharyngeal portion of the tonsillotome, which after being wrapped with thread is introduced into the naso-pharynx and there pressed against the bleeding spot for one or several minutes.

MÜLLER.

31. WHITING'S Eustachian electrode consists of a metal tube with a bulbous extremity not unlike an ordinary catheter, as which, in fact, it can be used, surrounded with a hard rubber envelope. The connections are made by means of a metal socket at the open end of the catheter and a wet sponge in the external meatus. He has found electrization of benefit in the tinnitus and deafness attendant upon atrophic rhinitis.

SWAN M. BURNETT.

32. MYLES devised a set of silver tubes of different sizes ranging from one, with a little larger calibre than that of a hypodermic syringe, to one with a canal of the width of No. 22 platinum wire. The tubes can be bent and easily introduced from the nasal cavity in the manner described by the author. They may be connected with rubber tubes for attachment to a proper syringe. For washing out the frontal sinus, the anterior end of the middle turbinated body should be removed and the infundibulum curetted. The ethmoid cells are washed out through an artificial opening in the roof of the space beneath the middle turbinated body.

MAX TOEPLITZ.

33. The advantage of the snare consists in the flattening of the tubes. The difference between the modified and the original snare lies in the greater length, in flattening the entire length, in the production of a more delicate canula, and in the addition of a curette to the guillotine.

MAX TOEPLITZ.

34. DUNOTT claims for his instrument that it retains its position under all circumstances, on account of its point of support being placed posteriorly on the neck, instead of in front, as it is in all other gags.

MAX TOEPLITZ.

35. The tongue depressor is $3\frac{1}{4}$ inches long, a little over an inch in its widest part, and concave in the lower portion, so as to cover the convex dorsum of the tongue.

MAX TOEPLITZ.

36. The male blade has at its distal extremity a curved knife, cutting scimeter-like on the convex and playing across the ring of the female blade. The inner margin of the ring is bevelled from the lower side, and ground to a cutting edge. The seizing hooks are separated when the instrument is fully opened. For operation the instrument is introduced wide-open, the uvula is encircled, and the handles are rapidly approximated.

MAX TOEPLITZ.

37. MUNGER, in addition to Müller's modification, desires the distal portion of the ring to present a heart-shaped appearance

thus allowing the posterior edge to straddle the posterior edge of the septum. This modification closely resembles that shown by Politzer at a meeting of aurists in London.

MAX TOEPLITZ.

38. These scissors, with a handle like that of Loewenberg's forceps, only lighter, with a French lock and a guard near the finger-ring to prevent overaction, are $\frac{3}{4}$ inch in length, slightly curved with the concavity forward and rounded at the tip, and are best used in conjunction with a palate retractor. They are used for separating adenoids forming adhesions to the Eustachian tube, in extremely tough hypertrophies of the pharyngeal tonsil, and for trimming irregularities upon the pharyngeal wall after operation with other instruments.

MAX TOEPLITZ.

39. GIBBONS devises perforated metal tubes, flat and crescentic, in fifteen sizes, corresponding to those of Sajous' bougies. Their advantages are as follows: They allow (*a*) normal respiration, (*b*) applications to the mucous membrane, and (*c*) discharge of the secretions. They are valuable in most cases of nasal stenosis, especially in that of hay fever. In epistaxis they are used instead of anterior and posterior plugging in conjunction with soft rubber tubes by means of a method which is minutely described in the original. The metal tube covered with rubber may also be used for the correction of deformities from fractures.

MAX TOEPLITZ.

EXTERNAL EAR.

40. LANNOIS, M. The auricle in healthy individuals (*Pavillon de l'oreille chez les sujets sains*). Lyon, 1892.

41. WATERS, RUDOLPH. Large cavernous angioma, involving the integument of an entire auricle, successfully treated by dissection, free resection of the diseased tissue, and ligation of the different trunks in situ by a special method. *Med. News*, Dec. 22, 1892.

42. GUERMONPREZ and COCHERIL. Three operations of epithelioma of the auricle, followed by autoplasty. *Revue de laryng.*, etc., No. 19, 1892.

43. GILLIS, P. Dermoid cyst of the mastoid region. *Bull. de la soc. d'anat.*, Paris, March, 1892.

44. SHEILD, MARMADUKE. Cystic tumor of the auricle. *Med. Soc. of London*, Nov. 14, 1892.

45. ROUSE, E. R. Hæmatoma auris among the insane. *Lancet*, Dec. 3, 1892.

46. GRADENIGO, Prof., Turin. A case of symmetrical perichondritis serosa of the auricle. *Archivio Ital. di Otologia*, vol. i., p. 57.

47. ALBESPY, RODOZ. Cyst of the auricle. Operation. Recovery without deformity. *Revue de laryngol.*, etc., No. 24, 1892.

48. SECCHI. A new case of otolith. *Archivio Ital. di Otologia*, vol. i., p. 49.

49. SILT. The dangers of manipulations made for extraction of foreign bodies from the ear. *Revue gén. de chir. et de thérap.*, March 1, 1892.

50. RYAN and BARRETT. The use of mercury in foreign bodies. *Lancet*, Oct. 15, 1892.

51. VEIT, JUL. Clinical contributions to traumatic ruptures of the membrana tympani. *Münch. med. Abhandl.*, 1892.

52. DAVIDSOHN, Berlin. Fibrinous membranes in the external meatus after influenza otitis. *Deutsche med. Wochenschr.*, No. 41, 1892.

53. ROOSA, D. B. ST. JOHN. A case of exostosis of the external auditory canal. Removal. Considerable improvement in the hearing power. *Trans. Amer. Otolog. Society*, 1892.

54. BUILLET ET CADIOT. Observations and experience upon "otocariase symbiotique" in carnivora. *Soc. de biologie*, June 6, 1892.

55. LAVERAN. Acarus of the ear in the hare; reflex paraplegia. *Soc. de biologie*, Feb. 27, 1892.

40. LANNOIS examined the auricle of two hundred and fifty normal persons, and found his former view to be confirmed by these investigations, that the anomalies of the ear are too frequent in healthy individuals to ascribe great importance to them if found in criminals.

41. In WATERS' most interesting case, a man of thirty-two presented a sudden transformation of a nævoid spot into a large and rapidly growing angioma, which involved the whole of the integument of the auricle throughout its entire thickness with consequent hypertrophy of the cartilage. There was a preponderance of arteries in the morbid tissue. He first ligated the external carotid, which gave a cure for a time, but on re-establish-

ment of collateral circulation the trouble returned. Injections of carbolic acid gave relief, which however was not permanent. This auricle was then constricted by a septum of pins and ligatures at its base, which completely cut off the circulation and rendered cocaine anæsthesia perfect. The diseased integument was then carefully dissected off and the afferent arteries ligated in situ. The cartilage was left perfectly bare, but its vitality was not seriously interfered with, and recovery took place, which has remained the same for eight months. The ear is still slightly larger than its fellow and of a dull bluish-red color, but there is neither pulsation nor tendency to a return of the former condition.

SWAN M. BURNETT.

42. GUERMONPREZ and COCHERIL describe three cases of epithelioma of the auricle, which they had operated in the following manner. The tumor was removed, the surrounding parts were carefully curetted, and affected pieces of cartilage subperi-chondrichally excised. In order to avoid a deformity of the auricle and to reconstitute its natural form, a cuneiform isosceles portion with its base toward the antihelix was excised through the entire width of the auricle. The healing took place per primam intentionem. The result is very satisfactory, as can be seen from the appended drawings.

BOK.

43. GILLIS demonstrated a cyst, which had been situated between auricle and mastoid process at the neck and had pushed the ear forward. It had a fibrous pedicle, which had entered the external meatus, in order to be inserted upon the postero-superior portion of the osseous wall of the external meatus. It contained caseous masses and hair. The author brings the cyst into relation with the development of the first branchial fissure.

GELLÉ.

44. MARMADUKE SHEILD exhibited a cystic tumor of the auricle in a man aged forty-four, which had been in existence for the last twenty-eight years, and which was probably sebaceous in origin.

45. In a short note ROUSE gives his experience of hæmatoma auris among the insane. He thinks that the "insane ear," as it is sometimes called, is more frequent in acute mania and in the maniacal stage of general paralytics, than in other forms of insanity, and that the right ear is most commonly the one affected. The violence, which is the almost necessary exciting cause, may, however, be exceedingly trivial. Cases which develop this condition are usually much more rapid in their course than others.

Further, Rouse is of the opinion that it is seen more commonly in private institutions than in public asylums. He also thinks that it may very frequently be produced in sane people, especially in athletes, and is not of necessity associated in any case with degeneration of the arteries.

46. GRADENIGO mentions the heretofore known observations of tumors of the auricles with serous contents, as they were described principally by Hartmann. He divides them into : 1. sequelæ of hæmatoma ; 2. sequelæ of purulent, and 3. of serous perichondritis. He compares the latter with the serous gatherings upon the nasal septum, as had been described by Jurasz and Rousseau. The case observed by Gradenigo occurred in a robust young man, in whom serous cysts formed without demonstrable cause, at first in the right and two months later in the left auricle, completely symmetrical on either side in the region of the crura antihelicis. The contents were serous from the very beginning, without a trace of hemorrhage or suppuration. The bacteriological examination gave a negative result. Gradenigo explains the development by trophic disturbances.

GRADENIGO.

47. In the introduction ALBESPY discusses the difference between aural cysts and othæmatoma in accordance with Hartmann's views. It follows the description of his case. The operation was made in the following manner : incision of the cyst, exceedingly careful curetting of the surrounding parts whereby a portion of the cartilage was removed, and galvanocautery of the remaining cavity. The healing took place without deformity under compressive dressing.

BOK.

48. The microscopical and chemical examination of an otolith removed by SECCHI from the ear of a man, aged twenty-one, affected with purulent otitis media, resulted in the fact that the nucleus consisted of cotton with mycelia of a hypho-mycetes, which could not be diagnosed. In addition pavement epithelia and lime salts were found.

GRADENIGO.

49. The operative interferences were made in three stages as follows : First, injections of lukewarm water, with the auricle pulled backward, or rather the head of the patient brought into an inclined position. Secondly, if this is without avail, small hooks and forceps may be used but only if the use of instruments is familiar to the physician. Finally, if these procedures fail, the auricle may be ablated, the membranous meatus incised, and

if necessary the osseous posterior wall partially removed with forceps and chisel. GELLÉ.

50. In a former issue the attention was drawn to a somewhat remarkable case recorded by Marmaduke Sheild, in which a mass of lead in the ear had been successfully removed by the use of metallic mercury. RYAN and BARRETT point out that metallic mercury has no such solvent action upon pure lead, though the ordinary plumber's solder, which contains one part of tin, loses nearly fifty per cent. of its weight on exposure to the action of mercury, and that the method has failed in a case of their own in which a bullet had become impacted in the meatus. They also suggest that Sheild's success may have been due to some slight inflammation round the edges of the impacted mass, rather than to the action of the mercury. Sheild replied by admitting that the mass in question was ordinary plumber's solder, and points out that he first saw the patient six weeks after the accident, when there were so signs of inflammation round the edges of the lead; that repeated use of syringes with various-shaped nozzles had, prior to the use of the mercury, entirely failed to move the impacted mass, whereas the first application of an ordinary syringe, after the use of mercury, was rewarded with success.

51. VEIT'S paper is based upon forty-three ruptures of the membrana tympani, which were observed at the surgical polyclinic at Munic among 6,500 aural affections (0.66 per cent.). Among these forty-three ruptures were four direct ones, produced by a penetrating body, twice in the antero-inferior, once in the antero-superior quadrant, and once at the boundary line between the antero-inferior and the postero-inferior quadrant. Seven ruptures occurred through extension of a fracture of the bones of the skull to the membrana tympani and also through intense concussion (stroke of a hammer upon the head). In thirty-two cases the rupture took place by sudden rarefaction of the air in the external meatus, twenty-seven of these by blows to the ear, four by detonations, one by a blow during bathing. In twenty-one cases of the latter category, the seat of the perforation was ascertained to be in the anterior half, in four superiorly, in eleven inferiorly, in the posterior half in five. Among the forty-three ruptures, ten were associated with concussion of the labyrinth. In one case a large perforation was closed by the interior membrane of the shell of a chicken's egg.

52. DAVIDSOHN removed by injections gelatinous structures,

1½ *cm* long and ½ *cm* thick from the external meatus, consisting for the greater part of fibrine fibres, between which round cells were embedded, in the interior parts isolated, in the marginal portions in groups. In addition, numerous micrococci were found. The author contradicts the view of "croupous inflammation" of the cutis (Bezold) and asserts the existence "either of blood in the external meatus or lymph discharged from excoriations of the meatus and membrana tympani, or of both fluids combined, from which fibrine is exuded under certain conditions." Such conditions may be due to organisms in the external meatus, or their products of disintegration, to the epithelia thrown off, and perhaps to the influenza itself. NOLTENIUS.

53. ROOSA's patient was a rather delicate woman of forty-six years, in whom there was no history of gout or syphilis. A tumor in the right auditory canal was discovered two years ago. Hearing distance in this ear $h = \frac{c}{40}$, bone-conduction longer and louder than air-conduction on that side. The tumor sprang from the posterior wall, filled the lumen of the meatus, and was sensitive to the touch. In its removal a sharp gouge and hammer were used and after a few taps it separated at its base and was drawn out by a hook. Very slight hemorrhage followed. Hearing distance increased to $h = \frac{6}{40}$. SWAN M. BURNETT.

54. This affection occurs principally in the dog, cat, and ferret. It develops from cerumen in the external auditory meatus, upon the surface of which small grayish-black spots are formed. The effect differs according to the age of the animal. The young animals readily succumb under nervous symptoms, which resemble reflex epilepsy; they do not eat, and die. The affection when recognized can be easily cured by lukewarm irrigations and injections of calcium sulphuricum. The disease can be readily transferred from one animal to another. The parasites are larger in the dog than in the cat, and larger in the cat than in the ferret.

GELLÉ.

55. LAVERAN observed in a rabbit for two months paralysis of the backside and scabies in the ears. The cerumen was examined during the autopsy. The naked eye distinguished small, movable, whitish granules, acarus parasites. These were very numerous at the bottom of the external meatus. The middle ears were normal, and also the cerebro-spinal centres. According to Laveran there existed a reflex paralysis. GELLÉ.

MIDDLE EAR.

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57. WOLFENSTEIN, JULIUS. Cocaine in the treatment of acute inflammations of the ear. *N. Y. Med. Jour.*, Nov. 5, 1892.

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59. THEOBALD, SAMUEL. The value of weak solutions of bi-chloride of mercury in the treatment of otitis media suppurativa. *Trans. Amer. Otol. Soc.*, 1892.

60. RONNIER, M. Note on the mechanism of the opening of the Eustachian tubes in a case of naso-pharyngeal and palatine alterations of syphilitic origin. *Soc. paris. d'otologie*, Dec. 2, 1892.

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63. HOFFMANN, R. Chronic otorrhœa. *Correspondenzbl. des allgemeinen ärztl. Vereins von Thüringen*, No. 7, 1892.

64. BLAKE, CLARENCE. Suppuration of the middle ear. *Trans. Amer. Otol. Soc.*, 1892.

65. RAYMOND and NETTER. Suppurative otitis; infectious pseudo-rheumatism. *Bull. med.*, p. 119, 1892.

66. RANDALL, B. A. Excision of membrane and malleus for catarrhal deafness, followed by suppuration, mastoid empyema, and burrowing abscess of the neck. *Trans. Amer. Otol. Soc.*, 1892.

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69. CHEATLE, ARTHUR H. The mastoid antrum in children. *Lancet*, Dec. 3, 1892.

70. URBANTSCHITSCH, Vienna. Electric transillumination of the mastoid process. *Wiener klin. Wochenschr.*, No. 21, 1892.

71. OROGOZO. Indications for the opening of the mastoid process in infectious otitides. *Thèse*, Paris, 1892.

72. POLITZER, Prof. Perforation of the mastoid process in cases of influenza otitis. *Brit. Med. Jour.*, Dec. 31, 1892.

73. HAUG. Operative cases of mastoiditis occurring in tuberculosis and morbilli. *Arch. f. Ohrenheilk.*, vol. xxxiii., p. 164.

74. UCHERMANN. Cholesteatoma of the mastoid process. *Norsk. Magaz. for Lægevidensk.*, No. 4, 1892.

75. BLAKE, C. J. Mastoid cases. *Trans. Amer. Otol. Soc.*, 1892.

76. BACON, GORHAM. A case of mastoid disease following an operation for the removal of adenoid vegetations. *Trans. Amer. Otol. Soc.*, 1892.

77. KIPP, C. J. A case of purulent inflammation of the middle ear with double optic neuritis, but without tenderness of, or spontaneous pain in, the mastoid process, in which the opening of the mastoid cells was followed by a rapid subsidence of the optic neuritis and cure of the ear disease. *Trans. Amer. Otol. Soc.*, 1892.

78. POMEROY, O. D. Eight cases of mastoid disease, exhibiting somewhat extensive carious processes. *Trans. Amer. Otol. Soc.*, 1892.

79. KNAPP, H. A case of chronic purulent otitis media; old pulmonary tuberculosis; opening of the mastoid. Death from acute basilar meningitis. Autopsy. *Trans. Amer. Otol. Soc.*, 1892.

80. ROOSA, D. B. ST. JOHN. Wound of the lateral sinus during an operation upon the mastoid process in a patient with phthisis pulmonalis. Septicæmia. Recovery. *Trans. Amer. Otol. Soc.*, 1892.

81. SUTPHEN, T. Y. Result of opening the mastoid in a case of chronic middle-ear suppuration with cerebral complications and septicæmic symptoms. Recovery. *Trans. Amer. Otol. Soc.*, 1892.

82. EMERSON, T. B. A case of pyæmia following acute suppurative otitis. Recovery. *Trans. Amer. Otol. Soc.*, 1892.

83. ALLPORT, FRANK. Purulent brain deposits and phlebitis

and thrombosis of the cerebral veins and sinuses following ear disease. *Four. Amer. Med. Assoc.*, Oct. 18 to Dec. 31, 1892.

84. BRIEGER, ARTHUR. Contribution to the pathology and treatment of sinus thrombosis in affections of the middle ear. Dissertation, Würzburg, 1892.

85. STRAZZA, Genoa. A case of labyrinth necrosis with apparently preserved function of hearing. *Il Sordomuto*, p. 91, 1892.

86. PYE-SMITH. A case of cerebral abscess secondary to otitis media, and followed by pyæmia and death. *Lancet*, Dec. 24, 1892.

87. Prof. GRADENIGO. Deafness and deaf-mutism in non-suppurative otitis media. *Il Sordomuto*, No. 1, 1892.

88. JACK, FREDERICK L. Remarkable improvement in hearing by removal of the stapes. *Trans. Amer. Otol. Soc.*, 1892.

89. STETTER, Koenigsberg. Contribution to the operative treatment of deafness in consequence of impediments of sound conduction. *Monatsschr. f. Ohrenheilk.*, etc., No. 8, 1892.

90. POLI. The mobilization of the stapes. *Il Sordomuto*, p. 61, 1892.

56. Among thirty-one cases of aural affections, in the treatment of which cocaine was used (solutions of 1:5 or 1:4 were for five or ten minutes in contact with the membrana tympani, which was partially perforated or imperforate), the author had observed that in six cases of sclerosis of the membrana tympani the perforation could be made without pain, but that tenotomy of the tensor was painful. Three paracenteses of the drum-membrane, seven cuttings through the posterior fold at two places on account of adhesions in consequence of chronic catarrh of the Eustachian tubes, six removals of polypi, six malleolar extractions, were made with complete anæsthesia. The author believes that by means of establishing complete anæsthesia with cocaine, it will be possible to perform exploratory paracentesis more frequently. Gellé and Potiquet point out the accidents following the use of cocaine, which consisted in one case of prickling in one half of the tongue, in another case in angina præcordialis and vertigo. The strength of the solutions used in the first case was 1:5, in the second case three to four drops of a solution of ten per cent. GELLÉ.

57. WOLFENSTEIN reports that he has used a five per cent. solution of the hydrochloride of cocaine in about 100 cases of

acute otitis media and found it not only analgesic but curative when used in the early stage. Only five per cent. of the cases going on to suppuration. The instillation should be made every two or three hours.

SWAN M. BURNETT.

58. DELSTANCHE reports additional extremely favorable results from injections of fluid vaseline through the catheter into the middle ear. Even when combined with iodoform it never produced the slightest local reaction. In adhesions of the membrana tympani better action was observed from forced injections than from the aërial douche. Injections were also successfully used in exudative catarrhs of the middle ear. Delstanche used in either case a syringe containing about four grammes, the contents of which were more or less forcibly discharged through the catheter into the Eustachian tube. Delstanche thus explains the action of the fluid surrounding the aural structures, that it deprives them of their tendency to form adhesions. In acute inflammations of the middle ear injections of pure vaseline or especially of that with iodoform produce immediate decrease or cessation of pain and cessation of inflammatory processes.

59. THEOBALD has had a satisfactory experience in treating some cases of otitis med. suppur. with weak solutions (1 to 8,000) of bichloride of mercury. The ear is syringed with this generally not oftener than once a day.

SWAN M. BURNETT.

60. In consequence of syphilis the cartilages of the alæ nasi, a large portion of the palate, vomer, and velum had been destroyed. Upon each side of the pharynx two thick, fleshy cords descended to a sinus at a level with the completely distorted arytenoid region. In extreme yawning, the tubopharyngeal fold became marked, and the mouth opened slightly down and inward. Auscultation with the otoscope demonstrated that the air entered the tympanic cavity at the same moment. The patient, when singing a tone in yawning, experienced autophony, which was distinctly recognized by the observer from the resonance and the secondary movement of the membrana tympani.

61. SCHEIBE, during the last epidemic of influenza, found in the secretions of acute otitides the same bacilli as during the preceding one (*Centralbl. f. Bacteriol. u. Parasit.*, 1890, No. 8. "Bacteriological Contribution to Otitis Media in Influenza"), whereas they had been missing in genuine acute otitis media investigated in the intermediary period. He did not succeed in

producing pure cultures according to the ordinary methods. Scheibe considers these bacilli unquestionably as the exciting cause of influenza. Since Pfeiffer, Ritasato, and Canon also had not been satisfied with the ordinary methods for cultivating influenza bacilli, he thinks to be justified in assuming, that his bacilli are identical with those cultivated according to especial methods by these authors. The difference in size and form may be explained by analogous relations found in other kinds of bacilli (degeneration). MÜLLER.

62. MONNIER performs paracentesis of the membrana tympani in all cases, in which Politzeration alone had not cured the patient, since tension and tinnitus disappeared and the normal relation between bone- and air-conduction returned. GELLÉ.

63. HOFFMANN's paper represents the views held and the procedures taken at the aural clinic at Jena. After elaborate discussion of the various symptoms of chronic otorrhœa (suppuration, location, and form of perforation, caries of the walls, formation of polypi), Hoffmann proclaims as therapeutic principle the consideration of the hearing function, in addition to the removal of all diseased processes. He insists upon Kessel's priority with reference to the excision of the membrana tympani and ossicles and enters into the discussion of the different therapeutic measures and their special indications, for which we refer to the original. (We regret exceedingly that this noteworthy paper has been published in an almost unknown journal.—Reviewer.)

ZARNIKO (Hamburg).

64. The gist of BLAKE's paper which is written in the highest scientific spirit is that while we remove the malleus and incus for suppurative disease of the tympanic cavity primarily, and only expect a good result upon hearing power in proportion as this removal increases the mobilization of the stapes,—when we wish in non-suppurative disease to improve the hearing power, we must attack the stapes directly and it may be solely.

SWAN M. BURNETT.

65. A man aged forty-three, of robust constitution, suffered for fifteen years from otorrhœa of the right side. On January 12th chills, fever, articular pain. The physician diagnosed acute articular rheumatism. On January 18th the patient was admitted to the hospital. Typhoid condition, movement of the large joints extremely painful; joints reddened and swollen. On January 22d, death during collapse. Autopsy revealed arthritis suppurativa.

tiva multiplex, broncho-pneumonia terminalis. No suppuration in other intestines, offensive pus in the right ear. The examination resulted in a pure infection with streptococcus pyogenes. The terminal broncho-pneumonia only was caused by pneumococcus simultaneously with pneumobacillus. In the aural suppurations, streptococcus was found simultaneously with numerous kinds of bacteria. This is a case of chronic otorrhœa, produced by streptococci and complicated with infectious pseudo-rheumatism.

GELLÉ.

66. RANDALL removed the drumhead and the malleus in a young man who was almost deaf from long-standing and progressive catarrh of the drum cavity. The operation was somewhat difficult and the incus was displaced upward and not rescued. There was no immediate reaction, but on the third day a violent suppurative otitis set up which led to a mastoiditis and a burrowing of pus in the neck from which he, however, made a final recovery, but without any improvement in hearing.

SWAN M. BURNETT.

67. GRUNERT's paper is a continuation of the reports published by Ludewig in the *Arch. f. Ohrenheilk.*, vols. xxix. and xxx., supplementing the statistics on the cases operated by Schwartze up to the beginning of 1892. For the decision of the question, whether the malleo-incudal extraction alone was sufficient for the cure of certain chronic aural suppurations or not, Grunert excluded twenty-two among seventy-five cases operated by Ludewig, viz., nineteen cases which were immediately followed by chiselling of the mastoid antrum, and three cases in which the incudal extraction had failed. Twenty-eight of the remaining fifty-three cases had recovered when Ludewig's paper was finished. Grunert submitted, after $1\frac{1}{4}$ to $1\frac{3}{4}$ years, Ludewig's cases to an exact examination, and found: among the twenty-eight cured cases twenty-two permanent recoveries, two relapses of the suppuration, and four cases untraceable; among the twenty-three cases designated as non-cured, subsequently two recovered spontaneously, two were cured by chiselling, and seventeen were not cured at the time, two cases were not traceable. Grunert excludes from the statistics of his cases: 1. thirty-three cases in 4 of which the malleo-incudal extraction from the external meatus was immediately followed by the typical opening of the mastoid process, and in 29 of which Stacke's modification of chiselling the antrum was

performed. 2. Fifteen cases (50 *per cent. of all*) in which the typical malleo-incudal extraction (bleeding at the bottom, too narrow meatus) failed, viz., the incus, in twelve cases, could not be removed; in three cases neither malleus nor incus. "It is remarkable that in almost three quarter of these cases recovery took place, and that even in two cases in which the extraction of the malleus and the incus failed, recovery also occurred." Grunert explains this by the fact that the secluded malleo-incudo-squamal cavity (attic), the isolated site of the caries which produces suppuration, is usually widely opened, or even entirely destroyed, by the attempts at extraction. Finally four cases of chronic sclerotic catarrh of the middle ear are to be excluded in which an attempt was made to produce an improvement of hearing by the malleo-incudal extraction. Grunert reports twenty-eight cases which are detailed, and illustrated by twenty drawings of the condition found by otoscopy. The otorrhœa had in most cases developed in childhood, in three cases only after the beginning of puberty. Acute infectious diseases were mentioned as causes in twelve cases. The result of the malleo-incudal extraction consisted in thirteen cures, thirteen failures, and two cases still under treatment. With reference to the function the operation resulted in: no marked impairment of hearing, not even in the case in which the stapes also was unintentionally removed, but marked improvement of hearing in ankylosis of the malleo-incudal joint, complicating the caries. The pathological condition was as follows: in the twenty-eight collated cases the malleus was found to be normal in thirteen, the incus only in three cases. Both ossicles were normal in two cases, and both were carious in fourteen. 2. In all cases of isolated incudal caries the malleo-incudal joint was intact. 3. The long process of the incus appears to be an especial place of predilection. 4. The complete destruction of the carious incus by granulations appears to be much more frequent, or rather to occur much more rapidly than that of the carious malleus. With reference to the diagnosis Grunert mentions that we had the not unfrequent opportunity to observe otoscopic pictures, which appeared to be typical of the presence of incudal caries, and in such cases the diagnosis was usually confirmed by the condition found during operation. With reference to the dangers from the operation it is stated that exitus letalis did neither directly nor indirectly occur through the operation. Among seventy-one

cases facial paralysis occurred twice. Severe and persistent vertiginous phenomena were not observed by Grunert. The stapes was unintentionally extracted in two cases. The incus hook devised by Ludewig was exclusively used for operation. Grunert argues against Stacke's method as follows: It is true that 50 per cent. failures took place by the removal with the hook, but in thirty-three cases operated according to Stacke, the removal of the incus with the forceps failed also in eighteen cases. In narrow meatus of some cases even the chisel could not be relied upon, on account of the danger of fatal accessory injuries. Finally, a slighter operative interference should be preferred as long as it seems sufficient, viz., in isolated caries of the ossicles to operate from the external meatus.

RUMLER.

68. RANDALL gives in a table the measurements in detail of 122 skulls as a preliminary contribution to his more extended studies upon the subject, and deduces from these that Koerner's hypothetical law is not constant by any means, but that as a general rule the lateral sinus is apt to be larger and more superficial on the right side, and the room for operation on that side may be a little less. It is evident, too, that minimum results may be found on either side, and in any form of skull.

SWAN M. BURNETT.

69. CHEATLE gives a careful account of the mastoid antrum in children. His conclusions confirm those of some other observers, viz., that both developmentally and anatomically the antrum must be regarded as part of the middle ear, serving to secrete and store a lubricating material for use in the tympanic cavity, and he suggests that as the present name is misleading, it might more appropriately be termed the "tympanic receptaculum." A point of some practical importance, brought out by Cheatile, is that a small bony tubercle may often be felt close to the attachment of the auricle, separated from the mastoid process by a slight groove, and that if a hole be drilled straight in at this tubercle, it will open into the antrum.

70. URBANTSCHITSCH found in diseased, transilluminated mastoid processes, a considerable decrease of transparency, which was even entirely missing. In three cases the diagnosis was confirmed by the operation. In one case of wellnigh complete absence of transparency of the mastoid process, the transparency gradually returned with the decrease of inflammation. The

method does not admit of a positive diagnosis, and is of value only with simultaneous consideration of other phenomena.

71. OROGOZO arrives at the conclusion that, in acute, infectious otitis, the opening is indicated : 1. If the infectious character of the lesion is ascertained, leading to accelerate the time of perforation on account of rapid action of suppuration. 2. If the acute symptoms intensely persist at the usual time of abatement, unless the other ear becomes infected. 3. If, after closing of a spontaneous perforation or paracentesis of the membrana tympani, symptoms occur from the mastoid process. 4. If, the topical symptoms of purulent otitis being absent, cerebral symptoms appear on the tenth, fifteenth, and twentieth day, whereas the disturbance of the ear itself does not account for them. 5. If the fever suddenly rises in the course of acute otitis, after the severe fever phenomena had ceased. If, in swelling of the mastoid with deep-seated fluctuation, an osseous fistula is found after Wilde's incision, the too narrow canal should be enlarged. If, after Wilde's incision, an osseous fistula is not found, the views differ on the measures to be taken. It seems, however, to be more correct to trephine the bone if the suppuration lasts several weeks and intense fever sets in. GELLÉ.

72. POLITZER's paper treats of perforation of the mastoid in cases of otitis media due to influenza. He considers that this condition, which occurs with exceptional frequency, is due primarily to the passage of pathogenic organisms from the pharynx. With regard to symptoms, Politzer points out that the pain is continuous and the mastoid very tender, but there is not of necessity, or even generally, any cutaneous infiltration in uncomplicated cases. In the same way, too, communication with the antrum does not always occur. With regard to treatment, he believes that if seen early we should try the effects of counter-irritants and antiphlogistics, but if these have no effect, or if the case is of some standing, we ought to make an incision over the mastoid and gouge away the superficial layer of bone, until we come down upon the seat of the pus.

73. I. Primary central tuberculosis of the mastoid, simulating neuralgia in the beginning. The diagnosis was very difficult, since no cause could be ascertained of the extreme pain in the mastoid in the patient, suffering from chronic, sclerotic catarrh of the middle ear, and no other external symptoms of inflammation were present than a small infiltrated gland upon the mastoid,

which was found to be extremely tubercular. HAUG thinks that the infiltration of this gland in primary central tuberculosis is to be considered as one of the earliest symptoms. II. Acute caries of the mastoid in consequence of morbilli, with remarks on the technique of permanent drainage of the operated mastoid. Haug emphasizes the frequency of acute affections of the bone after measles, and reports as evidence the following cases : *a*, Multiple perforation of the membrana tympani, and acute caries of the mastoid. On the sixteenth day after the beginning of otitis, on the seventh day after the beginning of mastoiditis, the operation was performed, and extensive necrosis of the bone was found. In order to keep the osseous wound open, Haug uses, to his extreme satisfaction, permanent canulas, made of hard rubber of the form of a short aural speculum, with a slight curve at its inner half directed toward the auditus ad antrum. The canula is thus enabled to be firmly fixed in its position. *b*, Bilateral acute otitis media, bilateral acute subperiosteal abscess and acute caries. *c*, Otitis media acuta sinistra before appearance of exanthem, acute empyema of the left mastoid with epidural abscess ; caries of the malleus and incus. *d*, Acute primary empyema and caries of the mastoid ; secondary inflammation of the tympanum.

RUMLER.

74. UCHERMANN reports a case of cholesteatoma of the right mastoid process, which, after painless, intermittent, suppurative discharge of this ear, suddenly caused violent pain in the temporal bone and fever. There appeared pain upon pressure against the mastoid process and the tragus, œdema of the posterior and upper wall of the external meatus, and some cholesteatomatous masses at the bottom. White scar upon the mastoid process (after an abscess fifteen years ago), above which some œdema. Chiselling presented a cavity of the size of a chicken's egg of irregular form posteriorly, the sinus being exposed anteriorly, communicating with the osseous meatus, the posterior wall being carious. The cavity was filled with detritus, caseous masses, cholesteatomatous lamellæ, and some granulations springing from the walls. The further course ran without fever. The treatment was finally applied from the external meatus. Etiology, importance and mode of operation of the affection are briefly discussed.

UCHERMANN.

75. In the first six months of the year BLAKE has treated twenty-five cases of mastoid congestion ; of these, three were

treated by the continuous cold coil with excellent effect. The twenty-two other cases came at last to operation. In three the wall of the sinus had to be removed, and in three the suppuration extended down into the tissues of the neck. Two cases died—one from meningitis, through the tegmen tympani, and one from pneumonia. Operative details the same as in the cases reported at the last meeting of the society, except that the rongeur was used to enlarge the opening in the cortex in a few instances. In two cases the mastoid cavity was allowed to fill with blood at the conclusion of the operation, and then irrigated superficially with water as hot as could be borne. These healed in five days and in a most satisfactory manner.

76. In BACON'S case the otitis media purulenta set in after a rude attempt at removing adenoid vegetations, and this was accompanied with a mastoiditis, which was successfully treated with cold applied by means of a Leiter coil.

SWAN M. BURNETT.

77. KIPP'S case is most interesting and instructive from the fact that there were none of the ordinary symptoms of mastoid disease, though there was a constant and long-continued flow of pus from a perforation in the upper part of the drumhead, and the walls of the meatus were swollen. In the course of time a pronounced double optic neuritis developed, which determined Kipp to open the mastoid. He found the cortex sound but a cavity the size of a hazel-nut filled with pus and granulations. Improvement set in immediately and the result was a perfect cure.

SWAN M. BURNETT.

78. The special points insisted on by POMEROY in these eight cases, which are reported at some length, were that no great effort was made to remove all the dead bone, only that which was loose and easily detachable being taken away. Antisepsis and drainage were carefully looked after and the nourishment was well cared for. In one case most or all of the petrous pyramid was thrown off. There was one death in the eight cases.

SWAN M. BURNETT.

79. KNAPP'S case is interesting and most instructive from the fact that, whereas the history and symptoms pointed to intracranial suppuration, the autopsy showed the basilar meningitis (which was the immediate cause of death) to be due to tubercle and not to an extension of inflammation from the drum or mastoid cavity. Knapp had opened the mastoid and found it affected

with a sclerosing ostitis. The lungs were studded with tubercle, the presence of which was not suspected during life.

SWAN M. BURNETT.

80. In ROOSA's case a young girl, affected with otitis suppurativa in the left ear for fifteen months, developed symptoms of mastoid disease, for which an operation was considered necessary. An opening in the bone was made with a trephine and exploration made with a Bowman's probe. Suddenly there was a gush of purple blood, which Roosa thought came from the lateral sinus. The wound was closed at once by means of an oakum plug. There set in almost immediately symptoms of pyæmia, which continued for two months, but from which she finally recovered with a cure of her ear trouble. In treatment no drugs were used except to quiet the pain.

SWAN M. BURNETT.

81. In SUTPHEN's case, a girl of sixteen years, there was a chronic suppuration of the left middle ear of long standing, upon which there supervened symptoms of septicæmia but without anything definite referable to the mastoid except pain. There was swelling of the retinal veins but no neuritis. There was a tender swelling of the neck extending from the ear downwards and beneath the sterno-cleido-mastoid muscle. The mastoid was opened, but only a few drops of pus were found. Some ten days afterward pus began to flow freely from the mastoid opening with an immediate improvement in the symptoms.

SWAN M. BURNETT.

82. In EMERSON's case, a woman of twenty-four years had an acute otitis media suppurativa sinistra following influenza. There was at no time any mastoid complication but she had well defined septicæmia affecting the lungs and numerous abscesses, chiefly along the sterno-cleido-mastoid muscle on that side. At the end of four months recovery took place. No treatment but rest, anodynes, and nourishment, with opening and antiseptic dressing of the abscesses. Temperature charts are given.

SWAN M. BURNETT.

83. ALLPORT has done a good service to otology by collating and tabulating the histories of 169 cases of ear disease in which the brain has been implicated. In his reports there was either a history of ear trouble with resulting intracranial affection, death, and an autopsy, or there was ear trouble with intracranial complication and the brain exposed by an operation. The first 6 cases whose histories are recorded are from his own practice. Some of

the results of this investigation can be summarized as follows : There were 86 men, 46 women, and in 37 the sex was not stated. More cases occurred between twenty-three and twenty-five years, but the average age was between nineteen and twenty. The right ear was the one affected in 81 cases, the left in 69, ear not stated in 19. The cerebral trouble followed upon chronic ear disease in 118 cases, upon acute aural disease in 10, not stated 41. The most frequent line of passage for the inflammation is through the roof of the tympanum, the next frequent is through the inner mastoid plate to the posterior cerebral fossa. The disease may proceed, however, by way of the internal ear and particularly through the semicircular canals. Almost all cerebro-aural pus deposits are accompanied by more or less meningitis. The abscess is seldom encapsuled. There is a detailed study of the symptoms pointing to cerebral disease, from which we learn that a sub-normal temperature may exist, but that it is not a necessary accompaniment ; nor is a high temperature usually observed. There were 158 deaths and 11 recoveries. The skull had been opened spontaneously or otherwise 21 times, and in these are comprehended all the recoveries, which is a good showing for operative interference. The special features characteristic of phlebitis and thrombosis of the lateral, cavernous, superior longitudinal, and superior and inferior petrosal sinuses and the mastoid emissary and facial veins are also considered in detail with their differential diagnostic features. This valuable paper will amply repay a careful study.

SWAN M. BURNETT.

84. Full and elaborate discussion of the relations of sinus thrombosis. Of the four histories given by BRIEGER, the last one is remarkable. In a case of acute purulent otitis media, the bulbus venæ jugularis is injured by galvano-caustic paracentesis (cp. Ludewig's and Hildebrandt's cases, *Arch. f. Ohrenh.*, 1892). The bleeding was stopped by plugging. On the fifth day pyæmia. On the ninth day exitus letalis.

ZARNIKO.

85. STRAZZA became convinced that, in a case of sequestrum of the cochlea with preservation of hearing, this was to be ascribed to the perception of the healthy ear.

GRADENIGO.

86. The case of cerebral abscess secondary to otitis media, and followed by pyæmia and death, reported by PYE-SMITH, occurred in a child, aged ten, with a history of discharge from the left ear for eighteen months, and acute cerebral symptoms for three days. The patient was trephined two days after admission

to the hospital, the mastoid antrum was freely opened, and pus was found in the cerebrum ; death from pyæmia ensued on the ninth day after the operation. At the necropsy, in addition to the abscess cavity in the cerebrum, and secondary abscesses in the viscera, a septic thrombus was found in the left lateral sinus, extending down to the external jugular vein.

87. GRADENIGO refutes Boucheron's theory of otopiesis, and disputes that Rohrer's case was one of torpor of the perceiving apparatus caused by increase of pressure of the labyrinth ; he is inclined to believe that this deafness was anæsthesia acustica hysterica, as in the cases described by Magnus, Bürkner, and Bayer.

GRADENIGO.

88. In the sixteen cases whose history JACK gives, the hearing for the human voice was improved for all, and in some in a very remarkable degree. The hearing for the watch and the Koenig rods was not always increased. The operation of removal of the stapes, which he describes and illustrates by drawings of the proper instruments, has not been followed in his hands by any serious or even unpleasant events. There was complaint in a few cases of dizziness for a few days, but nothing more. He advocates the removal of the stapes not only in connection with the other bones, when they are the subjects of disease, but independently and through a membrane that has no perforation, leaving the other bones in place. When he does this, he makes an inverted V-shaped incision in the membrane just over the stapedio-incudal joint, giving a good view of the long process of the incus. The stapedius muscle is then cut by means of a slender knife behind the bone. The stapes is then severed from its connection with the incus. If the stapes is not loose, it is made so by passing a small knife around its base. A small hook is then introduced behind the head of the stapes and the bone drawn out. It usually comes away with some suction.

SWAN M. BURNETT.

89. STETTER has produced improvement of hearing in three patients with sclerotic drum-membranes by passive movements of the handle of the malleus by means of a small hook introduced through an incision made posteriorly to it. In one patient even the bone-conduction, which had almost entirely ceased, was restituted. With reference to the diagnosis of sclerosis of the middle ear, Stetter remarked that he could not in *one* among 3,000 patients make it beyond any doubt.

KILLIAN.

90. After incising the upper posterior portion of the membrana tympani, POLI mobilizes the stapes by means of a small hook. The operative procedure is not connected with any danger.

NERVOUS APPARATUS.

91. BEAUREGARD. Note on the part played by Corti's organ in the hearing (Note sur le rôle de l'appareil de Corti dans l'audition). *Bull. Soc. de Biologie*, June 18, 1892.

92. BEAUREGARD. Note on the rôle played by the round window. *Ibidem*.

93. GELLÉ, Paris. Three observations of different disturbances of hearing following neuropathic conditions (Trois faits de troubles de l'ouïe liés d'une neuropathie). *Annal. des malad. de l'oreille*, etc., No. 12, 1892.

94. TSAKYROGLOUS, M., Smyrna. Contribution to the study of Ménière's disease.¹ From my own practice. *Monatsschr. f. Ohrenheilk.*, etc., No. 11, 1892.

95. MONGARDI. Contribution to the treatment of Ménière's disease (Contributo alla cura del morbo di Ménière). *Bolletino delle malattie dell' orecchio*, etc., No. 2, 1892.

96. ATKINSON, T. RENEL. A case of apparent double labyrinthine deafness. *Lancet*, August 27, 1892.

91. Corti's organ plays a part which has been differently explained. According to Helmholtz, the membrane vibrates directly through the influence of the vibrations transmitted through the fluid of the inner ear. According to Gellé the membrane receives simply and purely the stroke of the vibrations of the fluid. BEAUREGARD bases his views upon investigations made on different animals with acute and weak hearing and upon histological specimens of the inner ear. He thinks that Corti's organ plays a considerable part in the perception of tones; for in animals with extraordinary hearing faculty, this apparatus is of especial thickness and tension. It does not deaden the sounds, but rather intensifies them. GELLÉ.

93. GELLÉ describes different disturbances of hearing following a neuropathy on account of three characteristic observations. In all these cases there was a marked or weak disturbance of

¹ The paper was extensively published in Greek at the beginning of this year as a monograph, with an historical bibliography.—Moos.

hearing. This is secondarily affected and reacts abnormally, whereby the most serious attacks are caused; the starting-point, however, of these unusual disturbances is located entirely without the ear and is of a more general character. Hence follows, how important such a diagnosis is for the treatment of hearing disturbances. The author believes that the peculiar changes in the hearing curve have a precise character in nervous deafness, even if extensive general disturbances are missing in nervous diseases. GELLÉ.

94. TSAKYROGLOUS has observed as causes of Ménière's disease, colds, influenza, mumps and therapeutic influences. In two cases, the vertiginous attacks appeared simultaneously with muscular convulsions of the upper arm of the corresponding side. In one of them also the corresponding side of the face participated. The duration of the attack was quite different, lasting from minutes to days and months. The entire disease lasted in one patient seventeen years. The acute, apoplectiform cases took according to TSAKYROGLOUS, mostly a slow course, and frequently relapsed. He recommends for treatment quinine with ergot ($\bar{a}\bar{a}$ 0.6 to 1.0 daily) and iodide of potassium. KILLIAN.

95. MONGARDI recommends for treatment of Ménière's disease, bromide of potassium, 3.0 grammes pro die, in connection with iron salts. Mongardi prefers these remedies to quinine, since they act more positively and rapidly upon the hardness of hearing. GRADENIGO.

96. ATKINSON describes the symptoms of a case of apparent double labyrinthine deafness. Additional interest is given to the relation inasmuch as the patient is Atkinson himself, and consequently the symptoms that he describes so graphically are entirely subjective in character. It appears that after a short period of slight premonitory tinnitus, Atkinson, one morning, was suddenly seized with vertigo, sickness, and violent tinnitus. He stayed in bed a week; the vertigo and nausea gradually passed off, but the tinnitus, now associated with deafness in the right ear, remained. During the course of the ensuing three months, although able to go about his work as usual, various nervous symptoms developed; these were mostly of an emotional character, but included also transient diplopia, slight elevation of temperature, numbness of the extremities, etc. In the fifth month, another acute attack almost identical with the first one, was experienced, the left ear being this time affected and remaining deaf. There does not ap-

pear to be any particular cause assignable for these attacks; the family history is good, and there is no personal history of severe injury, syphilis, or prolonged illness. The local condition is thus described: "Membrana tympani fair. Eustachian tube open to Valsalva. Vision normal; ophthalmoscopically normal." A variety of methods of treatment have been tried without much lasting success and Atkinson appeals to his professional brethren for further advice.

NOSE AND NASO-PHARYNX.

97. SCHROEDER, HENRY H. The treatment of a cold. *N. Y. Med. Record*, Jan. 30, 1892.

98. ROY, CHARLES D. Cough; some of its causes and its treatment. *N. Y. Med. Record*, July 2, 1892.

99. CISSIER. The nose in erysipelas. *Ann. des malad. de l'oreille*, etc., No. 11, 1892.

100. WATKINS, I. L. Hæmophilia. Its pathology and treatment, with report of cases. *N. Y. Med. Journ.*, Aug. 13, 1892.

101. DELAVAN, BRYSON D. The influence of certain diathetic conditions upon the prognosis in operations upon the throat. *N. Y. Med. Journ.*, Nov. 19, 1892; and *Trans. Amer. Laryng. Assoc.*, 1892.

102. THORNER, MAX, Cincinnati. Thrush of the pharyngeal and nasal mucous membranes concomitant with influenza. *N. Y. med. Wochenschr.*, Feb., 1892.

103. ANTON, WILH., Prague. Successful treatment with massage of the mucous membrane in chronic nasal affections. *Prag. med. Wochenschr.*, No. 49, 1892.

104. FELICI. Massage in the treatment of diseases of the ear, nose, and throat. *Il sordomuto*, No. 4, 1892.

105. KAHN, Würzburg. New preparations of myrrh. *Münch. med. Wochenschr.*, No. 31, 1892.

106. WINKLER, E., Bremen. In reply to the question: When are intranasal operations justifiable in Graves' disease? *Wien. med. Wochenschr.*, 1892, No. 40, and ff.

107. OPPENHEIMER. Rhinitis hypertrophica and amenorrhœa. *Berl. klin. Wochenschr.*, No. 40, 1892.

108. BRESGEN, Frankfort-on-the-Main. When do inflammations of the ear and other adjoining parts occur readily after nasal

and naso-pharyngeal operations? *Wien. med. Wochenschr.*, No. 45, 1892.

109. WEIR, ROBERT F. On restoring sunken noses without scarring the face. *N. Y. Med. Journ.*, Oct. 22, 1892.

110. BEAN, C. E. Nasal hydrorrhœa. *N. Y. Med. Journ.*, Dec. 10, 1892; *Trans. Amer. Laryng. Assoc.*, 1892.

111. CHAPMANN, S. HARTWELL. Some pathological conditions of the upper air passages coincident with attacks of "la Grippe." *N. Y. Med. Journ.*, Dec. 10, 1892; *Trans. Amer. Laryng. Assoc.*, 1892.

112. LIEVENS. The relations between affections of the nose and eye. *Deutsche med. Wochenschr.*, No. 48, 1892.

113. REVILLES, L. The nose of idiotics; pathological lesions. *Congr. de méd. mentale*, Lyons, Aug., 1892.

114. DIONISIO. Contribution to the study of nasal tuberculosis. *Il sordomuto*, p. 270, 1892.

115. MOURE. A new case of hard chancre of the left nostril. *Revue de laryng.*, etc., July, 1892.

116. HOPMAN. Nasal polypi at the ages below sixteen. *Berliner klin. Wochenschr.*, No. 52, 1892.

117. PARK, ROSWELL. Angio-fibroma of the nose. *Med. News*, Oct. 8, 1892.

118. DREYFUSS, ROBERT, Strassburg. Malignant epithelial growths of the nasal cavity. *Wien. med. Presse*, Nos. 36, 37, 38, 1892.

119. GERBER. Contribution to the knowledge of otoliths. *Deutsche med. Wochenschr.*, No. 51, 1892.

120. SEELIGMANN, MAX, Karlsruhe. Otoliths, with a report of two new cases. Dissertation, 1892.

121. GRÜNWALD, Munich. Contribution to the study of nasal suppuration, with special reference to the affections of the ethmoid and sphenoid bones and their surgical treatment. Munic, 1893.

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137. WATSON, SPENCER. On the influence of nasal stenosis on the general health. *Lancet*, Sept. 10, 1892.
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142. POLI. The place of insertion of the naso-pharyngeal polypi. *Bollet. delle mal. dell' orecchio*, p. 242, 1892.
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152. SCHEPPEGRELL, W. Hypertrophy of the lingual tonsil. *Med. News*, Oct. 29, 1892.
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155. NEWCOMB, JAMES E. Syphilis of the lingual tonsil. *Med. News*, July 2, 1892.
156. PARKER, EDWARD F. Vomiting induced by an elongated uvula; operation; relief. *Med. News*, July 23, 1892.
157. CONITZER. A haired pharyngeal polypus. *Deutsche med. Wochenschr.*, No. 51, 1892.
97. A cold is not a mere local disturbance, but frequently ac-

accompanied by general symptoms. It is contracted at moderately low temperatures, just above freezing point, best in moist atmosphere and especially in form of a draught. It is frequently provoked by indigestion, principally by alcohol. SCHROEDER therefore tries to prevent and treat cold by general and hygienic measures, and also tries to abort it in the very beginning in the well known manner. He emphasizes the local treatment, but condemns the use of cocaine. Complications from the accessory sinuses and the remaining respiratory tract are properly attended to.

MAX TOEPLITZ.

98. Besides the well-known origin of cough, viz., lungs, pleura, larynx, and trachea, cough may be a reflex irritation from nasal disorders, adenoids of the naso-pharynx, elongated uvula, hypertrophied faucial tonsils, enlarged lingual tonsil and from irritation of the auricular branch of the pneumogastric, as aural cough. There is also a gastric and hepatic cough and a cough during puberty. Whooping-cough is not fully discussed.

MAX TOEPLITZ.

99. CISSIER mentions the occurrence of primary rhinitis erysipelatos. He believes that it may remain isolated in some instances and alone manifest the infection with streptococci. It begins with chills and fever, frontal headache, dull pain in the nape of the neck, and frequent epistaxis, which is followed by sensations of burning and dryness in the nose, complete obstruction, muco-purulent, frequently hemorrhagic, discharge, not very copious; the mucous membranes are extremely congested and diffusely swollen, of the color of yeast of wine, studded with ecchymoses. The head is comparatively immovable, slightly inclined to one side. Pain occurs spontaneously and upon pressure in the lateral and upper portions of the neck, and depends upon glandular affections consecutive to rhinitis erysipelatos. Relapses of erysipelas and principally of catamenial erysipelas, are in the same case not supposed to be new infections. It follows from the paper that the nose plays an important part in facial erysipelas, and that therapeutic and prophylactic measures should be taken.

GELLÉ.

100. The hemorrhage occurred in WATKINS' patient, æt. sixty-one, from the nose and occasionally from different localities, except lungs and stomach, at intervals for fourteen years, running two or three years at a time, and in large quantities, and had its inception in an attack of rheumatism early in life. Pathologically, increased blood pressure, diminished contractility of the vessels,

and retardation of the coagulating power of the blood have been found to cause the disturbance. These conditions, according to Sainsbury and Ringer, are due to deficiency of lime salts, and the clinical and spectroscopic examination of the blood as well as the treatment with lime water seemed to verify these statements.

MAX TOEPLITZ.

101. DELAVAN, while not believing that exophthalmic goitre, lymphadenoma, and the strumous or rheumatic diathesis form contra-indications to throat operations, strongly advises against such operations in persons with hemorrhagic diathesis or "hæmophilia." He quotes a fatal case from his private practice, occurring in a boy, æt. two and a half years, whom, after previous careful inquiry with negative result, he had operated for adenoid vegetations. The maternal grandfather and several other members of the same line of the family were subsequently found to have been distinctly hemorrhagic. He does not place much faith in galvano-cautery for the prevention of immediate or secondary bleeding. He advises rigid examination prior to operation, and in existence of hæmophilia, abandonment of operative interference. He considers Watkins' proposition (see the preceding paragraph) to be most welcome and worthy of trial.

MAX TOEPLITZ.

102. In an individual weakened by influenza, THORNER observed the development of thrush beginning with deposits, isolated at first but confluent later on, extending along the velum palatinum to the pharyngeal wall, and finally proliferating through the entire naso-pharynx and both nostrils. This remarkable localization of the affection proves that the view of the growth of thrush exclusively in pavement epithelium cannot be sustained.

ZARNIKO.

103. In the ordinary forms of chronic nasal catarrh (with swelling), vibratory massage has yielded satisfactory results. The result appeared to be doubtful in rhinitis atrophicans without odor and in ozæna, because in the former the improvement disappears after the cessation of treatment, and in the latter, massage does not prevent the return of crusts and odor without simultaneous injections. In hypertrophic catarrh ANTON did not observe any improvement from this method.

POLLAK.

104. FELICI attained satisfactory results with massage of the mucous membrane in acute and chronic affections.

GRADENIGO.

105. Oil of myrrh (1:1), also called myrrholin and myrrh

ointment (ten per cent.), are these new preparations. The latter, in acute and chronic eczema of the introitus narium, had the same effect as the usual ointments, and in form of nasal suppositories so much as to "justify an attempt at intercurrent treatment in persistent cases." Myrrholin was even less successful.

MÜLLER.

106. According to WINKLER operative intranasal interference is indicated : 1. In total obstruction of the nose by large adenoid vegetations, polypoid growths, or masses of polypi ; occlusion of the posterior nares, extreme scoliosis of the septum, if it causes demonstrable or probable congestions in the vascular system of the adjoining organs, which are due to the severity of the disease. 2. In inflammatory alterations of the accessory cavities.

POLLAK.

107. OPPENHEIMER observed four patients in whom, after removal of large hypertrophies of the posterior extremities of the lower turbinated bodies, the menstruation returned and remained regular. Another patient with extreme chlorosis was treated with arsenic. Rapid recovery took place after removal of the hypertrophies.

RUMLER.

108. BRESGEN considers as the two main occasional causes of transmission of inflammations from the nose to the ear : 1, excessive and faulty blowing of the nose ; and 2, impeded efflux of suppuration due to swelling and other occlusion of the nose. The first mentioned cause is equal to the abuse and mistakes made in the use of nasal douches and similar procedures. He warns against cauterizations during the first examination of the nose, or against bilateral cauterizations, and recommends strict attention to after-treatment. He advocates methylene blue for this purpose, which after two or three days should be followed by powdered natr. sozodol. In hemorrhages consecutive to nasal operations Bresgen warns against occluding the nose for more than twenty-four hours. He orders the frequent and regular use of an ointment of lanolin-anhydr. Liebreich, 25.0 ; paraffini liquid, 5.0 ; ol. ros., gutt. 1, to be drawn into the nose. If the hemorrhage is not rapidly stopped, Bresgen cauterizes with cotton applied to a platinum probe and imbued with a from 20 to 40 per cent. solution of chromic acid.

POLLAK.

109. WEIR tries to restore sunken noses without scarring of the face. He overcomes the deformity resulting from the *flattened* bony ridge by dividing the ossa nasi with a chisel, first in the

median line and subsequently by fracturing them at the line of their attachment to the superior maxilla ; the sunken bridge is then raised and held *in situ* by a pin crossing the nose and secured by clamping on it a shot at each end. Chiselling may be done by small incision, bevelled in character or by the small engraver's chisel carried up through the nasal passages. In order to raise the sunken *central* cartilage, which is much more difficult, he inserted the sternum of a fowl, suitably trimmed, but had to remove it again after ten weeks. He was, however, more successful in three cases, by using an internal support of platinum, as first suggested by Martin of Lyons, the application of which is fully explained in the original. Weir also reports a case of monomania in a patient with an immense nose, intensely receding chin, and a diminutive mouth, whom he was urged to operate by three different operations for purely cosmetic purposes. TOEPLITZ.

110. Nasal hydrorrhœa is either due to injury to the brain, or is found in catarrhal subjects or such as have a marked neurotic temperament. BEAN reports three cases of the latter class, which closely resemble nasal reflex neuroses, and begin suddenly with sneezing similarly to hay fever. The attacks occur periodically or continuously, with puffiness of the nasal mucous membrane and frequently merge into bronchitis and asthma. Internal administration of antispasmodics are of more benefit than local remedies, even galvano-cæutery and cocaine. MAX TOEPLITZ.

111. CHAPMANN selected sixteen cases with secondary affections of the upper air passages coincident with influenza. In two of the rheumatic-gouty cases and in one of spinal neurasthenia, aphthæ of the mouth and pharynx occurred, extending to the brim of the larynx. In one of the renal cases and in one of the former, laryngitis crouposa and sanguino-purulent naso-pharyngeal inflammation combined with acute tonsillitis and sympathetic enlargement of cervical glands took place. The swelling of the tonsils, threatening suffocation, was reduced by free incision. In a case of diabetes, intense congestion of the entire pharynx and œdema of the larynx did not disappear until after the lapse of three weeks from the time of onset. Among the eight spinal cases, five suffered from severe purulent naso-pharyngeal inflammation, one of tabes also from severe and dangerous hemorrhage and aphonia. MAX TOEPLITZ.

112. LIEVENS describes the histories of cases of a number of reflex neuroses of the eye (lachrymation, ciliary neurosis, bleph-

arospasm), which were partly cured, partly much improved by nasal treatment (galvano-caustic destruction of hypertrophies of the mucous membrane, removal of mucous polypi, excision of adhesions between turbinated body and septum, etc.).

NOLTENIUS.

113. The majority of cases in lunatics exhibit deviations of the nasal partition wall to the left, which may even lead to deformities. The deviation is almost invariably associated with thickenings of the curvature of a ribbed form. The nasal cavities are frequently affected by chronic catarrh. Hypertrophy of the mucous membrane, of the septum and turbinated bodies, frequently occurs as consequence of stenosis due to deviation of the septum.

GELLÉ.

114. DIONISIO observed two cases of nasal tuberculosis. In a case of a female, aged eighteen, a circumscribed growth was found upon the septum, which consisted of tubercular tissue. In another case ulcerated granulations were found in a peasant, aged twenty-two. In the first case permanent recovery took place.

GRADENIGO.

115. The entrance of the left nostril was partly taken up by an ulcerated tumor which was about the size of a 50-centime piece. The tumor was situated in the region of the quadrangular cartilage. Its syphilitic nature was not recognized before the appearance of the secondary phenomena.

GELLÉ.

116. The relative frequency of nasal polypi in children, as emphasized by HOPMAN in 1885 against the general concourse of opinion, is now confirmed by his experience of later years, during which he had found up to the end of the year 1889 twenty-one nasal polypi in patients below sixteen years of age, viz., in four per cent. of all cases. Hopman distinguishes three forms of nasal polypi: mucous, fleshy, and raspberry polypi; the first being prevalent among children, although the others also occur. Among the mucous polypi he mentions especially the multiple ones, which may be extremely persistent and numerous (two cases), and the large, rapidly growing, usually unilateral, solitary naso-pharyngeal polypi, which can be quickly and completely removed according to Hopman's bimanual combined method, but return after long or brief periods. It seems, however, that relapses are unusual after puberty. Two tables of the heretofore observed cases are appended.

RUMLER.

117. The patient, a woman æt. forty-six, had even when a

little girl a red spot at the tip of her nose, but rather on her left side, which gradually increased with each pregnancy (seven altogether) during the latter months of gestation, without occasioning any inconvenience except slight tenderness to the touch. The inside of the nostrils presented the same redness and vascularity. The lesion was originally a *nævus*, which became hypertrophied, so as to form a fibroma, closely resembling elephantiasis. After its removal by means of a V-shaped incision and of galvanocautery applied to the inside, the nose appeared almost normal.

MAX TOEPLITZ.

118. DREYFUSS describes a case of carcinoma of the nasal cavity, complicated by *ozæna* of thirty years' duration, and by empyema of all accessory cavities. The microscopical examination of the operated tumor had the following result: The entire covering is formed by pavement epithelium of several layers with slightly horny surface; the deepest layers consist of reeved cells with deeply stained nuclei. The subepithelial connective tissue is normal in the zone situated directly below the epithelium, but shows extensive small-celled infiltration farther below, around the neoplasma proper. There is not much left of the glands, and forms transitional from glandular to carcinomatous alveolæ are not found. The carcinomatous portions proper consist of atypically arranged epitheloid cells, which are stratified at many places in pearls and "onions." The epithelial covering is sharply limited against the connective tissue.

POLLAK.

119. A large concretion removed in narcosis by crushing, proved to consist chemically and microscopically for the greater part of calcified microbes with a small cotton pellet as a nucleus.

NOLTENIUS.

120. On account of two observations of rhinoliths SEELIGMANN gives a full and elaborate description of all their relations.

121. This work, like many other excellent books, offers many difficulties to reviewing. It contains so many new facts and the old ones are so fully discussed from other points of view as to make an exhaustive review as elaborate as the original. The greater part of the book treats of chronic empyema of the accessory cavities. From the general symptomatology we draw special attention to *ozæna*, polypi, and hypertrophies. The value, or rather the fallacy of transillumination for the diagnosis and treatment, the correct surgical principle of extensive opening and drying of the diseased cavity, are duly emphasized. The antrum

Highmori is treated somewhat briefly, its diseases being sufficiently well known from the abundance of other treatises. On the other hand, empyemata of the ethmoid and sphenoid cavities are fully treated, the frontal sinuses comparatively briefly. Such lack of uniformity may be faulty in a *text-book*, but is easily explained from the character of the treatise, which is based principally upon the author's own extensive experience, as evidenced by a selection of twenty-seven fully reported histories of cases. The author exhibits sharp observation, sound judgment, and correct, frequently cutting criticism. His argumentation, although not always quite in accordance with our views, is perused with great pleasure, as very suggestive and instructive. We highly recommend the perusal of this book to every practitioner, not only to rhinologists.

ZARNIKO.

122. Among the cases elaborately described by SCHWARTZ, one is remarkable, in which after puncture of the antrum Highmori from the lower nasal meatus, about twenty drops of a transparent fluid escaped. In two other cases peculiar disturbances of vision existed, the musculi recti interni being so weakened as to render accommodation for the near distances of long duration impossible for reading and embroidering; in addition scotomata were noticeable.

KILLIAN.

123. The suppurating antrum Highmori had been opened by extraction of the first molar tooth, so as to enable the patient to suck out the pus readily and regularly. In the course of three years recovery took place without further interference.

KILLIAN.

124. REPP's dissertation (150 pages) contains a very complete bibliography and an elaborate discussion of all relations pertaining to the subject.

125. For the diagnosis of suppuration in Highmore's antrum the author recommends exploratory puncture with a thick troicart of the external nasal wall in the lower nasal meatus with subsequent irrigations. If this method fails, *e. g.*, in consequence of thickening of the external bony wall, CHIARI performs puncture according to Ziem from the alveolar process. He discusses also the other method according to Hartmann, viz., irrigation from the orificium sinus maxillaris, but was successful only in a very few cases. Five histories of cases are added.

BOK.

126. The empyema of the frontal sinus operated by VALUDE was associated with marked cutaneous swelling and loss of sub-

stance of the bone toward the orbita. The anterior wall of the frontal sinus was trephined, the cavity scraped, disinfected, and drained by a double drainage-tube. Rapid recovery.

127. RANKIN dwells fully upon the anatomy of the sinuses, and, after enumeration of their different affections, details a case of gunshot wound immediately over the sinus. The injury, contracted in the civil war, had healed, leaving severe deep-seated pain in the forehead, which was immediately relieved after trepanation of the skull and evacuation of pus. Another instance of empyema of the sinuses, due to the grippe, occurred in an acute form with agonizing pain over the sinus, which was not relieved by anodynes and antiphlogistic remedies, but upon appearance of delirium, most successfully cured by opening of the outer table and discharge of $\frac{1}{2}$ ounce of healthy pus. Bibliography.

MAX TOEPLITZ.

128. On account of fifteen observations of his own, WINKLER fully discusses the etiology, symptomatology, diagnosis, and treatment of empyema. With reference to the first, among fifteen cases (two in males, thirteen in females, at the ages of from seventeen to fifty-two years), two cases were caused by strokes against the forehead, three by influenza, and one each by lues and ozæna. Six cases were permanently cured, three are still under observation ; four improved, but stayed away ; and two are still under treatment. In the majority of cases the pain was localized in the region of the sinus, the corresponding eye being frequently implicated, and almost all complained in addition about impediments of the nasal respiration, and only two about fetor. In seventeen cases only the suppuration was demonstrated by rhinoscopy ; in six cases it was even impossible by irrigations under strong pressure, according to Ziem. In three cases there existed swelling and redness of the frontal integument, and in eight cases sensitiveness to pressure upon the supraorbital nerve. Percussion had throughout a positive result, transillumination was of lesser advantage. With reference to the treatment, Winkler has not made use of the anatomical orifice, after many experiments on twenty-six skulls, since he considers probing only possible under especial circumstances, in extreme atrophy, lues, etc. The case of lues was thus treated, but all others according to Schaeffer's method of penetrating the lower wall of the sinus from the nasal cavity. Winkler advocates this method warmly, and considers trephining of the sinus wall to be indicated if the

former fails. The use of the air douche according to Hartmann is dangerous, since the "cavity may thus be inflated from the balloon with all kinds of micro-organisms," and since the secretions, which were not completely discharged, may be driven back into the cavity (!?).

MÜLLER.

129. HARTMANN introduces the discussion of the anatomical relations by the history of a patient operated by him. The diagnosis of empyema of the frontal sinus could only be made by exploratory irrigation. In order to produce free communication between frontal and nasal cavity, the frontal sinus was chiselled open from in front, the ductus naso-frontalis enlarged with the chisel, and the anterior end of the middle turbinated body removed by the conchotome. Hartmann believes to be justified in considering the entire absence of the naso-frontal canal as the fundamental type for the frontal sinus, which thus extends to the anterior end of the middle turbinated body, and enters freely through a wide fissure into the external portion of the middle nasal meatus. The portion situated below the nasal root is there narrowed by the ethmoid cells, which may advance from all the walls or develop upon them. The cells leave a space free in the centre, which may be designated as naso-frontal duct. This duct enters, as a rule, the anterior sulcus of the infundibulum, in some cases behind it the outer portion of the middle nasal meatus. Probes curved correspondingly readily enter the frontal sinus, if the access from the middle nasal is free. If the cells projecting from the different walls of the lower portion of the frontal sinus, which form the naso-frontal duct, are unequally developed, the naso-frontal canal is pushed off its direction in various ways. On account of his specimens, Hartmann, in accordance with Hausberg, believes that probing of the frontal sinus is feasible in well-nigh one half of all cases.

130. According to CHOLEWA's views the upper end of the hiatus semilunaris leads through an opening (ostium frontale) into the greatly dilated *most anterior* ethmoidal cell, which is said to represent normally the frontal sinus. In addition an especial *fronto-squamous space* is said to exist, into which a narrow, long duct leads. Probing of these ducts is impracticable in the living; on the other hand, probing of the frontal sinus is easy, if it enters the hiatus as the *most anterior* ethmoidal cell; one must, however, understand how to curve and introduce the probe correctly.

KILLIAN.

131. An osteoma of unusual size had in a young man, aged twenty-six, developed in the course of nine years, and had led to considerable deformity. The removal (with the chisel) offered great difficulties: the tumor, springing from the septum, of ivory hardness and lobated, sent forth processes into the left cavity, nose, and orbita; in addition it had perforated the strongly projecting wall anteriorly and posteriorly at several places. During the removal of the tumor an adherent portion of the posterior plate of the size of a 10-cent piece was also removed, thereby injuring the dura mater. The course of healing was undisturbed, the wound being closed on the seventh day by secondary sutures. The tumor weighed about eighty grammes. The author then discusses genesis, clinical course, diagnosis, and treatment. In comparatively young individuals with steadily growing osteoma, radical operation should be performed as early as possible, even if it is complicated with inflammatory processes; on the other hand, in older people and in standstill of development the treatment may be palliative or eventually consist in enucleation of the eyeball.

MÜLLER.

132. The tumor of the patient, aged twenty, occluded the right nostril, and was associated with marked exophthalmus. Thick and yellowish fluid was discharged through punctures. The tumor contained a large cavity, lined with thin mucous membrane. The very thin osseous walls were removed piecemeal. STRAZZA mentions in addition a case of complete membranous occlusion (congenital?) of the naso-pharyngeal cavity.

GRADENIGO.

133. SCHAEFFER adds to his former publications on the same subject, nineteen acute and fifty-three chronic cases of diseases of the sphenoid cavity, which he observed in the brief period of two years. The patients complained mostly of pains in the occiput and in the centre of the head, and some also of vertigo and pressure behind the eyes. Schaeffer recommends as method of operation, after precedent cocainization, the penetration with a straight probe at a level with the middle turbinated bone either through the anatomical orifice or through the thin osseous wall. In some cases the opening should be bluntly enlarged downward in order to facilitate the escape of discharges, irrigations with disinfecting fluids, and inflations with crystallized iodol.

NOLTENIUS.

134. The excellent paper of POTIQUET on thickenings of the nasal septum contains an elaborate description of the embryologi-

cal relations upon which Potiquet bases his conclusions. We regret that we have to limit ourselves to drawing the reader's attention to the paper.

135. STRAZZA was less successful with electrolysis in deviations of the nasal system than Moure. The action is slow and painful, but the subsequent reaction is slight. GRADENIGO.

136. DIONISIO gives a full description of the anatomical and clinical relations of the deviations of the nasal septum, describes the different methods of operation, and recommends a pair of scissors for the removal of the thickened and deviated portion of the septum. The strong blades are bent at an angle and cut at the end only. GRADENIGO.

137. After epitomizing the functions of the nose as a part of the respiratory tract, WATSON proceeds to inquire what modifications or interruptions are brought about by stenosis, whether the latter be temporary or permanent, partial or complete, and cases are cited to elucidate the various points. Reference is then made to the various complications, such as asthma, hay fever, snuffles of infants, stenosis connected with adenoid vegetations, syphilis, malformations and distortions of the septum, etc. With regard to treatment Watson is apparently of the opinion that one should rather err on the side of doing too much, than too little, that any operations undertaken for the relief of the stenosis should be thorough and effective, and that our failures are sometimes due to the frequent repetition of partial and incomplete operations. The paper concludes with the contention "that intranasal obstruction is often an important element in the class of cases referred to; that it is often overlooked, or, if found, despised or made light of; and that it should certainly be sought for and dealt with by local treatment in a very large class of diseases in which up to quite recently the influence has been more or less ignored." With these contentions we shall probably be all inclined to agree.

138. Exact anatomical description of atresia nasi.

139. In the patient, an intelligent boy, aged eleven, affected with congenital, bilateral osseous occlusion of the posterior nares, the pharyngeal openings of the tubes and the hearing were normal. The elaborate and interesting account of the condition is recommended to the reader for perusal. SIEBENMANN.

140. A robust peasant, aged nineteen, suffered since his childhood from stenosis of the right nostril through total occlusion of the right choana, which was osseous in the upper, membranous

in the lower half. The operation consisted in perforation of the upper portion by means of a pointed burner and subsequent enlargement with an ordinary forceps, both procedures were made in narcosis. On the following days moderate pain, on the fifth high fever, on the sixth delirium, loss of consciousness, on the following day exitus letalis. An autopsy was not permitted. The author believes that thrombosis of the sinus had taken place, probably due to abnormal course of the vessels. NOLTENIUS.

141. An account of ten clinical operations of typical fibromata of the naso-pharyngeal cavity performed at de Rossi's clinic, FERRERI does not believe extensive interferences to be justifiable, which are dangerous on account of hemorrhage, deform the face, and do not prevent relapses. The surgeon ought to limit his treatment to electrolysis, which brings most efficiently the patient to an immune age (of from twenty to thirty years). GRADENIGO.

142. POLI reports the clinical observation and autopsy of a case of polypus in the naso-pharynx. The polypus was situated upon the right half of the pharyngeal roof, the posterior end of the septum, the posterior extremities of the middle and upper turbinated bodies, upon the anterior surface of the sphenoid body, and the posterior end of the lamina cribrosa of the ethmoid bone. GRADENIGO.

143. The special features of the case consist in the sudden onset, the calculus probably having originated in the submaxillary gland. Two years after the beginning of the disturbance the calculus was removed. It weighed twenty-one grains, measured an inch in length, an inch in circumference at the larger, and three eighths of an inch at the smaller extremity; it resembled a date-seed, and consisted of carbonate and phosphate of lime. MAX TOEPLITZ.

144. In a case of destruction of the velum palati with antero-posterior cicatricial band crossing the fauces, cicatrization of the lateral pillars, more particularly of the right and bilateral otorrhœa, THORINGTON devised an artificial velum of soft rubber which was attached by a gold band to an artificial plate of vulcanized rubber, and fitted to the roof of the mouth. The velum was furnished with a "heel," which fitted into the naso-pharyngeal space when acted upon by the still remaining muscular power of the pillars. Speech and hearing power were greatly improved. MAX TOEPLITZ.

145. ROBINSON reports three cases of membranous sore throat

with false membrane, which could not well be placed, and in two of which streptococci were found without Loeffler's bacilli. If the microscope and the cultures of such cases discover cocci, the patient may either succumb or recover according to the intensity of the march of the disease. If the methods reveal the true bacillus of diphtheria, the cases present also either favorable or fatal termination, but admittedly with larger percentage of deaths in the latter form. This would not make much difference as regards remedial treatment, but it gives more confidence to the physician, and improves the prophylaxis to others, which is more rigid in cases where Loeffler's bacillus is found. Robinson does not believe in sulphur fumigations; he is greatly disappointed in bichloride of mercury, but he strongly advocates the use of cubebs in dry form for local treatment. MAX TOEPLITZ.

146. KNIGHT gives in this paper, which contains the introductory remarks for a discussion on the subject of the mycosis, the literature, describes the affection, and mentions the occurrence of the different forms of thread bacilli, as, *e. g.*, leptothrix diffusa and fasciculatus, and aspergillus. Although he does not express an opinion as to their causative relation to the affection, still he prefers to distinguish the cases with excessive growth and constant recurrence as typical cases of mycosis. He recommends galvano-cautery for treatment. The discussion brought out the fact that, apart from local applications, systemic or stomachic treatment was generally recommended. MAX TOEPLITZ.

147. KLINEDINST's patient, male, æt. seventeen years, six months, exhibited, apart from bilateral interstitial keratitis and capsular adhesion resulting from iritis, destruction of hard and soft palates, uvula, and part of palatine arches. From upper-posterior portion of posterior pharyngeal wall a movable soft growth hung down to about one half inch below, where the normal line of the left palatine arches would exist, completely occluding the left half of naso-pharynx, and extending to septum, which was easily penetrated by galvano-cautery. Slight deafness and tinnitus, due to pressure of growth and to mucus, was present. A band-like soft growth, not prominent, extending from roof of pharynx down to larynx on the right side, gradually decreased in thickness. Both swellings yielded to treatment.

MAX TOEPLITZ.

148. INGALS' patient, male, æt. fifty-nine, presented an enlargement of right tonsil, 4 *cm* in diameter, with thickening of

anterior pillar and uvula. After removal of the sarcomatous tumor by means of steel wire *écraseur*, the remaining ulceration healed upon applications of a 60 per cent. solution of lactic acid. Thickening back of posterior pillar increased, and the cancer progressed to base of the tongue, side of the pharynx, right side of the larynx, causing dysphagia and pain. Injections of 8–10 minims of a solution of from 25 to 50 per cent. of lactid into one or two places three times a week diminished the indurations, relieved the distressing symptoms, thus keeping the disease in check for ten months. The treatment is not curative, but the growth may thus be retarded for a long period.

MAX TOEPLITZ.

149. HALSTED has examined 286 children of from five to fifteen years of age, among whom were 114 feeble-minded ones and 154 from an orphan asylum. The total number of children affected with adenoids 63 (23.7 per cent.). The affection was not more prevalent among the feeble-minded children than among the orphans. Posterior rhinoscopy could be performed in eighty-five per cent. Halsted operated with Jurasz's modification of Loewenberg's forceps.

MAX TOEPLITZ.

150. The disease resembles somewhat a syphiloderm. The female patient was treated for six years on account of fibroma uteri with iodides and mercurials. An ulcer appeared two years ago upon the right tonsil and a small one upon the inside of the left cheek, spread six months ago to the upper lip, which became swollen, and extended to the lower lip. The differential diagnosis between tuberculosis, syphilis, and epithelioma was difficult. The piece of extirpated skin, upon microscopical and bacteriological examination, was found to be tuberculous.

MAX TOEPLITZ.

151. KOPLIK examined a large number of non-typical cases without or with membrane; made cultures from the material taken from the tonsils and inoculations of guinea-pigs to test their virulence. He found the streptococcus in the majority of cases *even* with Loeffler's bacillus, and he investigated also the relation of the latter to Hofmann's pseudobacillus, which he does not find side by side with Loeffler's bacillus. His inoculations with attenuated cultures for the production of immunity had a negative result. Koplik arrived at the following conclusions. *a*, The forms of diphtheria, which appear clinically without membrane, present the Loeffler-Klebs bacillus and are infective. *b*, Some cases of diphtheria without characteristic local manifestations

closely resemble angina. *c*, It is impossible to sift non-characteristic-true diphtheria clinically by mere inspection from non-characteristic angina. *d*, The true diagnosis lies in bacteriology.

MAX TOEPLITZ.

152. SCHEPPEGRELL analyzes fifteen consecutive cases of the affection, of which five occurred in males and ten in females, the ages ranging from 19 to 51 years, but most frequently between 19 and 30. Fourteen cases were observed in whites, one in a mulatto, and none in blacks.

MAX TOEPLITZ.

153. DAWBARN'S method consists in surrounding the bleeding surface with a strong purse-string ligature by means of a large semicircular needle, applying the stitches continuously so as to bury the loops in the tissues. The two transverse strokes of the needle may penetrate to about a quarter of an inch ; the two vertical ones, running along the pillars, may pass more deeply. The thread may be removed in from twenty-four to thirty-six hours.

MAX TOEPLITZ.

154. KITCHEN removes hypertrophied tonsils with Mackenzie's tonsillotome. He even claims to abort attacks of quinsy by performing tonsillotomy in the beginning of the attack, in contradiction to the prevalent views.

MAX TOEPLITZ.

155. NEWCOMB'S patient, a colored man, æt. thirty-one, revealed, about three months after the initial lesions, those appearances at the base of the tongue on either side of the median line, which had been best described by Moure and Raulin as ulcerations of nipple-shaped protuberances. The inside of the cheek and the anterior surface of the tongue were, in addition, studded with mucous patches. Newcombe fully enters into the anatomy, physiology, and pathology of the lingual tonsil in general as well as into the pathology of its syphilitic lesions and their differential diagnosis and treatment.

MAX TOEPLITZ.

156. The vomiting had persisted for two weeks in a singer, æt. twenty-one, and was instantly relieved by amputation of the uvula. The singing was also materially improved by the operation.

MAX TOEPLITZ.

157. Exact description of a haired pharyngeal polypus in a robust laborer aged twenty-six, which, inserted by means of a thin pedicle upon the anterior pharyngeal wall, consisted principally of fat, was supplied with blood-vessels and nerves, contained nuclei of cartilaginous and several lymph follicles, and was covered by outer integument and its appended structures. The tumor was removed with the cold snare.

NOLTENIUS.

REPORT ON THE FIRST MEETING OF THE SECTION ON OTOLOGY OF THE PAN-AMERICAN MEDICAL CONGRESS, HELD SEPTEMBER 5TH, 6TH, AND 7TH, AT "THE ARLINGTON," WASHINGTON, D. C.

Dr. C. M. HOBBY, of Iowa City, Ia., Presided. Dr. MAX THORNER, of Cincinnati, was Secretary.

In his opening address the President, referring to the presence of Professor Politzer, of Vienna, said : "Meanwhile we have assurance of the kindly help of our fellows from the denser populations of Europe ; and I congratulate you upon the presence with us of one whom we all reverence as a master, for whether we have been pupils at Vienna, or have through literature gleaned the steps by which Otology has advanced since the days of Toynbee, there is not one of us but who acknowledges a debt of gratitude for the landmarks established by Professor ADAM POLITZER ; and I think I voice the universal sentiment of felicitation that this genius is still active, and that he is here to speak for himself."

The formal address of the President was entitled : *The prevention of deaf-mutism*. He said that the assumption that fifty per cent. of the mutes are congenitally so, is not in accordance with facts, at least for the United States, as it is readily shown that not more than fourteen per cent., and probably only ten per cent., are born deaf. Also middle-ear disease plays only a small part in the production of mutism. The principal cause of deafness resulting in deaf-mutism is to be sought in the various forms of meningitis occurring in the early months of life, cerebro-spinal fever being a predominant factor in the United States. Prevention must come then principally from associated study of clinical history and pathology. Great difficulties arise in recognizing disturbance of hearing in infants, and in the fact that the ear lesion frequently follows

the acute disease without external manifestations, and after a considerable interval of time. Especially should the practitioners of the country be warned of the frequency with which deafness follows apparently slight ailments of children, and they should be impressed with the fact that destruction of hearing most frequently takes place without symptoms referable to the ear.

Dr. J. A. MALONEY read a paper on : *Otacoustic treatment ; its history and results upon the deaf and deaf-mutes*, demonstrating an instrument, called by him the otophone. This and the preceding paper were discussed by Drs. J. M. Bleyer, S. S. Bishop, H. B. Young, Prof. A. Politzer, and Dr. Moloney.

Professor POLITZER followed with a demonstration of a magnificent collection of anatomical and pathological specimens of the ear, exhibiting also a number of new or improved instruments for aural therapeutics.

Dr. M. THORNER read a paper on : *Pathological conditions following piercing of the lobules of the ear*. He criticised the reprehensible practice of piercing the lobes as a relic of barbarism, and related a number of cases where more or less severe sequelæ (as erysipelas, eczema, cleft lobule, fibroma, and keloids) had been observed after this procedure. Discussion by Professor Politzer and Dr. C. R. Holmes.

Prof. A. POLITZER gave an address upon : *A peculiar affection of the labyrinthine capsule as a frequent cause of deafness*. This most interesting and instructive lecture was elucidated by numerous drawings and microscopic specimens. (This paper will be published in full in these ARCHIVES.)

Dr. FELIX COHN followed with a paper : *On the application of Stacke's method in chronic aural catarrh*.

Dr. L. D. BROSE read a paper on *Opening the mastoid cells in acute inflammatory middle-ear disease*.

Dr. ALBERT H. TUTTLE followed with a paper entitled : *Chronic disease of the middle ear—its prognosis and surgical treatment*. He reviewed the different operations recommended of late, and was in favor of removal of the stapes in the dry form of aural catarrh. In suppurating otitis media the removal of the larger ossicles was recommended, while continued suppuration after removal of the ossicles and treatment of the middle ear required special (mastoid) operation.

Dr. S. S. BISHOP, in a paper on *The indications and preferable methods for mastoid operations*, expressed the belief that the ma-

jority of surgeons are too conservative both as to the time selected for surgical interference and the extent of the operation. He formulated six rules, by which he has been guided when to operate, and spoke in favor of Schwartze's method, modified according to the exigencies of each case.

The discussion on the preceding four papers was opened by Dr. C. R. HOLMES, who disfavored the operation of the removal of the stapes. In operating for suppurative processes in the attic or antrum many were too timid. We should use the utmost care to guard against opening into dangerous parts, but we should be bold enough to remove all the diseased tissue.

Professor POLITZER said that he never opens the antrum in acute cases. After opening the mastoid and scraping away all diseased bone, he tampons the wound with iodoform-gauze for one or two days. Of late he has closed the wound immediately after the operation, and the patients have left the hospital within a week. In chronic sclerotic middle-ear disease the extraction of the ossicles is, in his opinion, not likely to be followed by permanently good results.

Dr. JOHNSON ELIOT contributed a paper on *The phonograph in the treatment of deafness*. In his experience the phonograph has proved a failure in the treatment of deafness.

Dr. MAX TOEPLITZ presented a paper : *Clinical contributions to the study of aural syphilis*. He reported a case in which the labyrinth was affected primarily in the course of a freshly acquired case of syphilis. The aural affection began simultaneously with the appearance of roseola.

Dr. LAWRENCE TURNBULL read an elaborate paper on *The present condition of otology in Europe*. In the second part of this paper he referred at length to the operation of excision of the ossicles in chronic suppurative, or non-suppurative (progressive sclerosis or proliferous) disease of the middle ear, and expressed himself in favor of these operations, supporting his views by the report of a number of cases. The discussion which followed was participated in by Drs. Thorner, Maloney, Hobby, Berman, and the essayist.

Dr. DEAN exhibited a set of instruments for the application of the galvanic current to the orifice of the Eustachian tube.

Dr. M. D. LEDERMAN presented a paper on *Adenoids, a contributive factor in aural affections*. He advocates to examine the post-nasal space in all cases of chronic purulent otitis media in children.

482 *Section on Otology of the Pan-American Congress.*

In many cases we will find masses of lymphoid tissue, which must be removed to get good results. Thus we benefit not only the aural complication, but materially influence the general system as well. This paper was discussed by Dr. Fitzpatrick.

Dr. E. D. SPEAR contributed a description of a *Focussing ear trumpet* and had two instruments, a stationary and a portable one, on exhibition.

Dr. R. D. BARRETT demonstrated a new middle-ear powder blower.

Dr. B. ALEX. RANDALL presented a paper on *Craniometric measurements of five hundred skulls in relation to aural topographic anatomy*, in which he came to the conclusion that the cranial index gives little pointing as to the anatomical relations likely to be met by the operator; and it proves that maximal or minimal dimensions may be encountered in any type of skull.

At the beginning of the last session Prof. ADAM POLITZER was unanimously elected HONORARY PRESIDENT of the Section on Otology of the First Pan-American Medical Congress.

Book Reviews.

I.—Text-book on Otology for the Student and Practitioner. By Dr. KURD BÜRKNER, Extraordinary Professor of Medicine and Director of the Aural Policlinic of the University at Goettingen. With 136 wood-cuts from original drawings of the author. Stuttgart: Ferdinand Enke, 1892. x and 368 pages. Price, \$2.25. Reviewed by E. BLOCH, Breslau; translated by DR. MAX TOEPLITZ, New York.

Bürkner's text-book does not fill an urgent want, as is emphasized in the introduction by the author, but it will soon become a favorite with those who desire to be instructed in the present state of otology. The author occasionally adds a concise description of Prussak's space or of the attic (pages 218, 219), or he describes the plexus tympanicus, but, as a rule, he leaves the study of all physiological and anatomical details to the reader's pleasure.

This arrangement has the great advantage of treating the subjects comprehensively, yet leaving much space for the discussion of *clinical* conditions. The author has perfectly succeeded, as may be inferred from a brief review of the contents of the work, in carrying out his purpose of writing an essentially clinical text-book.

The first and general part contains an exact and clear description of the methods of examination. Otoscopy, examination of hearing, examination through the Eustachian tube, and rhinoscopy are treated of, and in the special part the electrical examination also. Bürkner recommends, after his experience of several years, Auer's¹ incandescent gas light as artificial source of light. It deserves the author's praise, especially after its latest improvements. Rhino-

¹ It is called Welsbach's incandescent gas light in this country.—M. T.

scopy is treated somewhat too briefly considering its importance in otology. On the other hand, the description of the methods of treatment, used in general, justly embraces much space. Syringing, introduction of drugs, injections through the Eustachian tube are described in such a manner as to give evidence of the practical experience of the physician and the academical teacher. The general part concludes with a brief chapter on the statistics of aural diseases.

The special part begins with the diseases of the auricle. Defects and excess of development of the auricle, its injuries, among which the othæmatoma is classed, the inflammations in their different etiological and clinical aspects, congelations and combustions separated from each other—are all described with sufficient exactness and in a concise form, as well as the new-formations.

The external meatus is fully considered in the increase of secretions and their treatment, and also in its inflammations with all their different forms. The new-formations and the foreign bodies are fully described according to the aim of the book. The part treating of the affections of the membrana tympani excels in the illustrations. Although the woodcuts cannot be compared with the colored pictures of the membrana tympani, as *e. g.*, in the author's atlas, the drawings, nevertheless, are sharp and characteristic. After the diseases of the tubes, those of the tympanic cavity, the most frequent of the ear, are discussed in corresponding detail. The author follows, for practical reasons, the usual division into acute and chronic catarrh and the same inflammations, and makes exact and reliable statements upon statistics, etiology, pathological anatomy (bacteriology), symptomatology, prognosis, course, and treatment. By the division of the subject-matter carried out strictly according to the above-mentioned principles, the single chapters are not unduly lengthened, and all essential points are given in a clear and concise form. The artificial drum membrane ought to be rather tried several weeks after the entire cessation of the discharge, "when no more noteworthy suppuration is present." Among the new formations of the ear the polypi justly occupy the largest space. Periostitis and ostitis of the mastoid process, and the operative opening of the latter, conclude this part of the book, together with a description of caries and necrosis of the temporal bone.

The diseases of the inner ear begin with the confession "that

our diagnoses of diseases of the sound-perceiving organs are only probable ones." The author, in spite of this somewhat depressing assertion, encourages the reader by the statement of so many positive facts in this difficult province, as to make it almost appear as an exaggerated modesty. From the valuable examinations of deafness of railroad employees and of persons in similar vocations, up to the latest microscopico-bacteriological investigations, many hopeful starting-points for a rational pathology of the inner ear are prepared. Bürkner devotes especial chapters to necrosis of the labyrinth, Ménière's complex of symptoms, diseases of the auditory nerve, new formations of the inner ear, subjective sensations of hearing, and deaf-mutism. He might have used in this place Holger Mygind's work on congenital deafness. After a description of the mostly used mechanical apparatuses of hearing, he appends a brief chapter on the most frequent diseases of the nose and pharynx. Among the symptoms and consequences of adenoid vegetations he might have mentioned, in addition to W. Meyer's "dead pronunciation," the disturbances of speech proper associated with the former.

These and similar exceptions to details do not decrease the value of Bürkner's text-book, which is one of the most useful in our specialty. Its excellent get-up is worthy of the contents.

II.—A Manual of Diseases of the Ear. By G. P. FIELD, M. R. C. S., Aural Surgeon to St. Mary's Hospital, London. Fourth edition. Illustrated with colored plates and wood-cuts. Philadelphia: Lea Brothers & Co., 1893.

This new edition of Mr. Field's valuable and popular text-book has been carefully revised and brought up to date. The octavo volume of 382 pages is handsomely gotten up, reasonably complete, clear, and concise in its descriptions, and can be heartily recommended as a book for the student and practitioner.

INDEX OF SUBJECTS AND AUTHORS.

- Abscess, Cases of Extra-Dural, 115
 ADAMS, Case of Thrombosis of the Lateral Sinus, 182
 Adenoid Vegetations, Fatal Hemorrhage after Removal of, 140
 ALLEN, "The Mastoid Operation," 135
 Anatomy and Physiology, Report on, 89, 415
 Auditory Nerve, Clinical Signs of Affections of the, 213
 Auricle, Case of Epithelioma of the, 166; Replacement of One, Bitten off, 163; Tumors of the, 441
 Autophony, 425

 BARATOUX, "Practical Guide to the Examination of the Diseases of the Larynx, Nose, and Ears," 134
 BARCLAY, Best Bend in the Shaft and Handle of Instruments for Deeper Portions of the Ear, 179
 BEZOLD, A Case of Removal of the Stapes, 400; Further Investigations upon the Continuous Tone Series, especially with Reference to the Physiological Upper and Lower Tone Limit, 216
 BLAKE, Removal of the Stapes, 78, 196, 305, 404
 BLAU, "Report on Otology in 1890 and 1891," 131
 Bone-Conduction, 434
 Book Reviews, 131, 230, 483
 Brain and Ear Diseases, 33, 143, 455
 Brain, Propagation of Ear Disease into the, through the Carotid Canal, 191
 BUERKNER, "Text-Book of Otology," 483

 CHEATLE, Hypertrophic Condition of the Tympanic Mucous Membrane in an Infant, 268
 Cocain in Aural Practice, 446
 Criminals, Anthropology of the Ears of, 378

 DAAE, A Contribution to the Anthropology of the Ears in Criminals, 378
 Deaf-Mutes, Hearing Power of, 170
 Deaf-Mutism, Pathology of, 208, 270
 DENCH, Case of Epithelioma of the Auricle, 166

 Ear, Observations on the Examination of the Normal, 1
 Ears, Relation between the Two, 430
 Editorial Notices, 231, 334
 EICHLER, "Anatomical Examination of the Paths of the Blood Current in the Labyrinth of the Human Ear," 135
 Ethmoidal Cells and Sphenoidal Sinuses, Mucocoele and Empyema of, with Displacement of the Eyeball, 313
 Eustachian Tubes, Examination of the, in Pure Catarrh, 12
 External Ear, Diseases of the, 438

- FIELD, "A Manual of Diseases of the Ear," 485
 Foreign Bodies in the Ear, Cases of, 103
 FREUDENTHAL, Two Cystoid Polypi of the Middle Turbinated Bone, 296
 GRADENIGO, On the Clinical Signs of Affection of the Auditory Nerve, 213
 Hæmophilia, and Operations on the Nose, 464, 465
 HEIMANN, Five Cases of Otitic Brain Abscess, 33
 Highmore's Antrum, Suppuration in, 126
 HOLMES, The Stacke Operation for Caries Involving the Middle Ear, Report of Twelve Cases, 337
 HUBBARD, An Apparatus of Precision for Inflating and Medicating the Tympanum, 27
 Influenza, Ear Diseases Following, 117, 447
 Instruments, Best Bend for Ear, 179
 Instruments, 433
 KNAPP, Mucocoele and Empyema of the Ethmoidal Cells and Sphenoidal Sinuses Causing Displacement of the Eyeball, Operation from the Orbit, 313; Otitic Brain Disease, Varieties, Prognosis, and Treatment, 143
 KOERNER, Propagation of Affections of the Tympanum through the Carotid Canal into the Cerebral Cavity, 191
 Labyrinthine Deafness, Cases of, 459
 Labyrinth, Total Absence of, Caused by Scarlatinal Otitis, 17
 LEMCKE, "Deaf-Mutism in the Grand Duchy of Mecklenburg-Schwerin," 132
 LOVE, Hearing Power of Deaf Mutes, 170
 Malleo-Incudal Extraction, Reports on, 110, 449
 Mastoid Cases, and Complications, 452.
 Mastoiditis, Case of Bezold's, 390
 Mastoid, Osteoma of the, 280
 Meatus, Lead in the, Removed by Mercury, 442
 Membrana Tympani, Death after Rupture of, 97; Ruptures of the, 442
 Menthol in Ear Diseases, 102
 Middle Ear, Diseases of the, 104, 444
 Middle Ear, Stacke-Operation for Caries of the, 337
 Miscellaneous Notes, 226, 329
 MOOS, Histology of Two Petrous Bones of a Girl Completely Deaf from Scarlatina, 64
 Mucous Membrane of Infants, Hypertrophic Condition of, 268
 MYGIND, A Case of Unilateral Total Absence of the Labyrinth, Caused by Scarlatinal Otitis, 17; Short Description of the Temporal Bones of Deaf-Mutes, from the Pathological Museum of the Copenhagen University, 239
 Nasal Cavities, Microscopic Anatomy of the Mucous Membrane of the, 384
 Nasal Polypi, in Children, 468
 New Growths of the Ear, 284
 New York Eye and Ear Infirmary Reports, 231
 Nose and Ear Diseases, 466
 Nose and Naso-Pharynx, 121, 459
 Obituary Notice, 141
 ORNE GREEN, A Series of Cases of New Growths of the Ear, 284; Osteoma of the Mastoid, 280
 Otitis Interna, 421
 Otitis Purulenta, Case of, Due to Caries of Molar Tooth, 203
 Pan-American Medical Congress, 229, 479

- Pathology and Therapeutics, Report on, 95, 427
- POLITZER, "Lehrbuch der Ohrenheilkunde," 230
- Railroad Employees, Hearing of, 429
- RANDALL, An Attempt to Replace an Auricle, Bitten off in Childhood, 163
- Report on the Progress of Otology during 1892, 89, 415
- Scarlatina, Histology of Petrous Bones after Otitis from, 64
- SCHWARTZ, Case of Otitis Purulenta with Caries of the Mastoid, Due to Caries of Second Molar Tooth, 203 ; "Handbook of the Diseases of the Ear," 134
- SHEPPARD, Three Cases of Unintentional Opening of the Lateral Sinus, 233
- SIEBENMANN, Functional Examination in Cases of Pure Catarrh of the Eustachian Tubes, 12 ; Observations on the Functional Examination of the Normal Ear, 1
- Sinus, Empyæma of Frontal, 471 ; Three Cases of Unintentional Opening of the, 233 ; Thrombosis of the Lateral, 182
- Stacke Operation, Report of Twelve Cases of, 337
- Stapes, Operation for Removal of the, 78, 196, 305, 400, 457
- SUCHANNEK, Contribution to the Microscopic Anatomy of the Human Nasal Cavities, 384
- Syphilitic Ear Diseases, 120
- Tabes, the Auditory Nerves in, 118
- Teeth, Disease of, Followed by Ear Diseases, 203
- Temporal Bone, Unusual Case of Fracture of the, 396
- Tones, Investigations into the Upper and Lower Limit of, 216
- Tonsil, Hemorrhage Following Excision of, Requiring Ligation of Common Carotid, 130
- Tuning-Fork Experiments, 99
- Turbinated Bone, Two Cystoid Polypi of the Middle, 296
- Tympanum, Hemorrhage into, of Traumatic Origin, 106 ; Instrument of Precision for Inflating and Medicating the, 27
- UCHERMANN, The Anatomical Condition Found in a Case of Deaf-Mutism Following Scarlatina, 208
- Vaseline for Injections into Tube, 447
- VON STEIN, "The Study of the Functions of the Different Parts of the Labyrinth of the Ear," 132
- VULPIUS, A Peculiar Case of So-Called Bezold's Mastoiditis, 390 ; An Unusual Case of Bilateral Fracture of the Temporal Bone, 396

CONTENTS OF VOLUME XXII., NUMBER 1.

1.	Observations on the Functional Examination of the Normal Ear. By Prof. F. Siebenmann. Translated by Dr. E. B. Dench, New York	I
2.	Results of the Functional Examination in Cases of Pure Catarrh of the Eustachian Tubes. By Prof. F. Siebenmann, Basel. Trans- lated by Dr. E. B. Dench, New York City	12
3.	A Case of Unilateral Total Absence of the Labyrinth Caused by Scarlatinous Otitis Intima. By Holger Mygind, M.D., Copen- hagen	17
4.	An Apparatus of Precision for Inflating and Medicating the Tym- panum. By Thomas Hubbard M.D., Toledo, Ohio. (With an illustration)	27
5.	On Five Cases of Otitic Brain Abscess with a Short Description of Otitic Brain Abscesses in General. By H. Heiman, Warsaw. Translated by Dr. Ward A. Holden	33
6.	Histology of Two Petrous Bones of a Girl Completely Deaf from Scarlet Fever; Died of Purulent Meningitis. By S. Moos, Heidelberg. Translated by Dr. C. Zimmermann, Milwaukee, Wis. (With Plates I. and II. of vol. xxiii., German Edition) . .	64
7.	Removal of the Stapes. By Clarence J. Blake, M.D., Boston . .	78
8.	Report on the Progress of Otology during the First Half of the Year 1892. By Prof. Ad. Barth, Marburg, and Dr. A. Hartmann, Berlin. Translated by Dr. Max Toeplitz, New York	89
	FIRST PART: Anatomy and Physiology. by Ad. Barth. SECOND PART: Pathology and Therapeutics. By A. Hartmann.	
9.	Reviews. Translated by Dr. Max Toeplitz, New York	131
	Report on the Progress of Otology during the Years 1890 and 1891. By Dr. L. Blau. Deaf-Mutism in the Grand-Duchy of Mecklenburg-Schwerin: A Statis- tico-Otological Study. By Dr. Lemcke. The Study of the Functions of the Different Parts of the Labyrinth of the Ear. By Stanislaus von Stein. Normal and Pathological Anatomy of the Nose and its Pneumatic Appen- dices. By Prof. D. E. Zuckerkandl. Haratoux. Guide Pratique pour l'Examen des Maladies du Larynx, du Nez et des Oreilles. (Practical Guide to the Examination of the Dis- eases of the Larynx, Nose, and Ears.) Anatomical Examination of the Paths of the Blood-Current in the Laby- rinth of the Human Ear. By O. Eichler. Handbuch der Ohrenheilkunde. Edited by H. Schwartze. The Mastoid Operation. By Samuel Ellsworth Allen.	
10.	Miscellaneous Notes	137
	A.—British. B.—American.	
11.	Obituary.	141

CONTENTS OF VOLUME XXII., NUMBER 1.

1. Observations on the Functional Examination of the Normal Ear. By Prof. F. Siebenmann. Translated by Dr. E. B. Dench, New York	1
2. Results of the Functional Examination in Cases of Pure Catarrh of the Eustachian Tubes. By Prof. F. Siebenmann, Basel. Trans- lated by Dr. E. B. Dench, New York City	12
3. A Case of Unilateral Total Absence of the Labyrinth Caused by Scarlatinous Otitis Intima. By Holger Mygind, M.D., Copen- hagen	17
4. An Apparatus of Precision for Inflating and Medicating the Tym- panum. By Thomas Hubbard M.D., Toledo, Ohio. (With an illustration)	27
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SECOND PART: Pathology and Therapeutics. By A. Hartmann.	
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Deaf-Mutism in the Grand-Duchy of Mecklenburg-Schwerin: A Statis- tico-Otological Study. By Dr. Lemcke.	
The Study of the Functions of the Different Parts of the Labyrinth of the Ear. By Stanislaus von Stein.	
Normal and Pathological Anatomy of the Nose and its Pneumatic Appen- dices. By Prof. D. E. Zuckerkandl.	
Baratoux. Guide Pratique pour l'Examen des Maladies du Larynx, du Nez et des Oreilles. (Practical Guide to the Examination of the Dis- eases of the Larynx, Nose, and Ears.)	
Anatomical Examination of the Paths of the Blood-Current in the Laby- rinth of the Human Ear. By O. Eichler.	
Handbuch der Ohrenheilkunde. Edited by H. Schwartze.	
The Mastoid Operation. By Samuel Ellsworth Allen.	
10. Miscellaneous Notes	137
A.—British.	
B.—American.	
11. Obituary.	141

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CONTENTS OF VOLUME XXII., NUMBER 2.

1.	Otitic Brain-Disease; its Varieties, Diagnosis, Prognosis, and Treatment, Illustrated by Cases from the Writer's Practice. By Herman Knapp, M.D.	143
2.	An Attempt to Replace an Auricle Bitten off in Childhood. By B. Alex. Randall, Philadelphia. (With four drawings) . . .	163
3.	A Case of Epithelioma of the Auricle. By E. B. Dench, M.D. . . .	166
4.	The Hearing Power in Deaf-Mutes; Being the Results of the Examination of 175 Deaf-Mute Children. By James Kerr Love, M.D.	170
5.	The Best Bend of Shaft and Handle in Instruments for Operation in the Depth of the Ear Canal. By Robert Barclay, A.M., M.D., St. Louis, Mo. (With a wood-engraving)	179
6.	A Case of Thrombosis of the Lateral Sinus. By John L. Adams, M.D.	182
7.	The Propagation of Affections of the Tympanum through the Carotid Canal into the Cerebral Cavity. By Dr. Otto Koerner, Frankfort-on-the-Main. Translated by Dr. Max Toeplitz, New York	191
8.	Removal of the Stapes. By Clarence J. Blake, M.D., Boston . . .	196
9.	A Case of Otitis Media Acuta Purulenta with Caries of the Mastoid Process Due to Caries of the Second Molar Tooth. By Dr. E. Schwartz, of Gleiwitz, Silesia. Translated by Dr. Max Toeplitz, New York	203
10.	The Anatomical Condition Found in a Case of Deaf-Mutism following Scarlatina. By Dr. V. Uchermann, Christiania. Translated by Dr. S. E. Allen, Cincinnati, O.	208
11.	On the Clinical Signs of the Affections of the Auditory Nerve. By Prof. G. Gradenigo, Turin, Italy. Translated by Dr. S. E. Allen, Cincinnati, O.	213
12.	Some Further Investigations upon the Continuous Tone-Series, especially with Reference to the Physiological Upper and Lower Tone-Limit. By Prof. F. Bezold, Munich. Translated by Dr. E. B. Dench, New York (With two illustrations)	216
13.	Miscellaneous Notes British Meetings of Societies. Appointments.	226
14.	Pan-American Medical Congress	229
15.	Books Reviews Lehrbuch der Ohrenheilkunde. By A. Politzer. New York Eye and Ear Infirmary Reports.	230
16.	Editorial Notice	231

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CONTENTS OF VOLUME XXII., NUMBER 3.

1.	Three Cases of Unintentional Opening of the Lateral Sinus. By J. E. Sheppard, M.D., Brooklyn, N. Y.	233
2.	Short Description of the Temporal Bones of Deaf-Mutes Belonging to the Pathological Museum of the Copenhagen University. By Holger Mygind, Copenhagen	239
3.	Hypertrophic Condition of the Tympanic Mucous Membrane in an Infant. By Arthur H. Cheate, F.R.C.S., London. (With one drawing)	268
4.	The Pathology of Deaf-Mutism. By James Kerr Love, M.D., Glasgow	270
5.	Osteoma of the Mastoid. By J. Orne Green, M.D., Harvard University	280
6.	A Series of Cases of New Growths of the Ear. By J. Orne Green, M.D., Harvard University	284
7.	Two Cystoid Polypi of the Middle Turbinated Bone. By W. Freudenthal, M.D., New York. (With four drawings in the text)	296
8.	Removal of the Stapes. By Clarence J. Blake, M.D.	305
9.	Mucocele and Empyema of the Ethmoidal Cells and Sphenoidal Sinuses, Causing Displacement of the Eyeball; their Operation from the Orbit. By Herman Knapp, M.D.	313
10.	Miscellaneous Notes	329
	I.—British.	
	A.—Meetings of Societies.	
	B.—Appointments.	
	C.—New Society.	
	II.—American.	
	A.—Meetings of Societies.	
	B.—Appointments.	
	C.—Editorial Notice.	

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CONTENTS OF VOLUME XXII., NUMBER 4.

1.	The Stacke Operation for Caries Involving the Middle Ear as Modified and Practised by Prof. Hermann Schwartz. With an Historical Sketch, Method of Operating, and Report of Twelve Consecutive Cases. By Dr. C. R. Holmes. (With ten figures in the text)	337
2.	A Contribution to the Anthropology of the Ear in Criminals. By Dr. Hans Daae, Christiania. Translated by Dr. Ward A. Holden	378
3.	Contribution to the Microscopic Anatomy of the Human Nasal Cavities, Particularly of the Olfactory Mucous Membrane. By Dr. Hermann Suchannek, Zurich. Translated by Dr. J. A. Spalding, Portland, Me. (With eighteen schematic drawings) . .	384
4.	A Peculiar Case of So-called Bezold's Mastoiditis. By Dr. W. Vulpius, of New York	390
5.	An Unusual Case of Bilateral Fracture of the Temporal Bone. By Dr. W. Vulpius, New York	396
6.	A Case of Removal of the Stapes. By Prof. Friedr. Bezold, Munich. Translated by Dr. Ward A. Holden, New York	400
7.	Removal of the Stapes. By Clarence J. Blake, M.D.	404
8.	Report on the Progress of Otology during the Second Half of the Year 1892. By Prof. Ad. Barth, Marburg, and Dr. Arthur Hartmann, Berlin. Translated by Dr. Max Toeplitz, New York. 415 A.—Anatomy. } By Ad. Barth. B.—Physiology. } C.—Pathology and Therapeutics. By A. Hartmann.	
9.	Report on the First Meeting of the Section on Otology of the Pan-American Medical Congress, held September 5th, 6th, and 7th, at "The Arlington," Washington, D.C.	479
10.	Book Reviews	483
	I.—Text-book on Otology for the Student and Practitioner. By Dr. Kurd Bürkner. Reviewed by E. Bloch, Breslau, and translated by Dr. Max Toeplitz, New York.	
	II.—A Manual of Diseases of the Ear. By G. P. Field, M.R.C.S.	
11.	Index	487

NOTICE TO CONTRIBUTORS.

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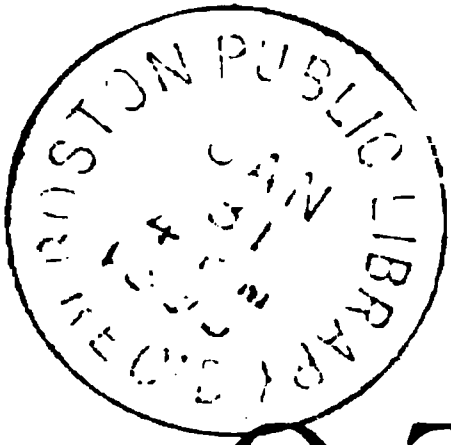
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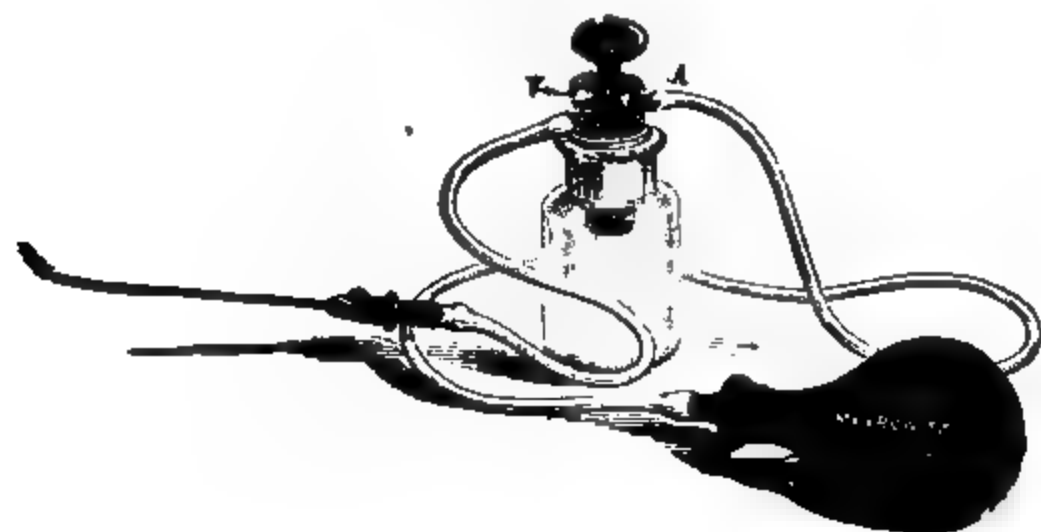
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